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One in quest of interesting reading matter would hardly hunt up a bunch of waybills to satisfy the longing. Yet if one's tastes are cultivated in this direction it is remarkable how much satisfaction may be derived by dropping in at a freight station, asking for the waybills, and studying them. At least one general manager of a railroad makes this a regular practice, and the things that he finds in these innocent looking pieces of paper are fast stirring up his subordinates to do the same thing. Some of the weaknesses the bills bring out are discussed under the head of educational meetings in the article on "Studies of Operation—St. Louis & San Francisco," which appears elsewhere in this issue. Poor and wrong car loading, bad distribution of cars, slow movement of cars over a division or through a terminal, excessive delays due to "bad ordering" of cars, and lack of co-operation between the yardmaster and the car repair foreman are a few of the abuses which they show up in clear and unmistakable terms. If a little group of terminal employees, including, say, the agent, despatcher, yardmaster, master mechanic, car repair foreman and others, is gathered around the superintendent or assistant superintendent while such a study is being made, the conditions are ripe for locating and stiffening up weak points and doing away with bad practices.

Waybills Locate Inefficiency

There is a bill before the New York legislature, introduced last week by Senator W. R. Herrick, to amend the highway law of the state so as to require automobiles to be stopped before passing over a railroad crossing. It is to be hoped that this bill will become a law; and with an adequate penalty for disobedience. And, indeed, such a rule is a good thing for drivers of horses as well as those operating motors. There are many situations where such a rule is unnecessary, of course; but motorists are of such varied quality—careful or reckless, alert-minded or absent-minded—that the only workable rule is a severe one. Railroad officers, if called on, could tell the lawmakers, from long experience, how necessary it is for careful men to submit to irksome restrictions because of the dangers inseparable from working with men less careful. It is difficult enough to enforce safe practice at crossings of one railroad with another, where all drivers (enginemen) are subject to effective discipline; yet on the highways we—the public—allow persons of all degrees of ignorance or dullness, and subject to no discipline except the remote discipline of the police court, to operate machines which are often as deadly as a hundred-ton steam locomotive. The railroads, even if only in the narrowest self-interest, will work for a stopping requirement in the highway law, for the average automobile is more likely than the average horse and wagon to throw a train off the track. The National Highways Protective Society (chief office in New York City), promoter of the Herrick bill, is doing excellent work for the safety of highway travel, including the abolition of grade crossings, but it encounters strong opposition from shortsighted interests devoted only to the promotion of automobile sales; it deserves the co-operation of railroad officers, as well as of all other good citizens who desire to make travel safe.

Proposed Regulation of Automobiles

The Chesapeake & Ohio has sold its $32,000,000 5-year 5 per cent. notes at a price which, including bankers' commissions, will cost the railway company 6⅛ per cent. This is a more advantageous arrangement for the Chesapeake & Ohio than would be indicated by the course of its stock directly after the announcement of the sale was made. The bankers—Kuhn, Loeb & Company and the National City Bank—took the notes on condition that the railroad company put $17,000,000 into the property from surplus earnings during the five years. To carry out this agreement, the Chesapeake & Ohio has pledged itself, if necessary, to suspend dividend payments. It is this possibility of a neces-

An Essentially Sound Policy

sary suspension of dividends—the company is now paying 4 per cent.—that was the ostensible reason for the rather large decline in the price of Chesapeake & Ohio stock on Friday of last week. In making this agreement by which stockholders will forego immediate return on their investment if necessary, in the interest of the property, the directors are pursuing a policy which is quite unique in railway history. It is not unusual for bankers to exact certain conditions on agreeing to buy an issue of securities, but such conditions usually have to do quite strictly with the market for the securities. Thus the Chicago, Rock Island & Pacific, when it sold its debentures a few years ago, agreed not to sell any more bonds for a certain length of time; but while this was an aid to the bankers it had nothing to do with the operation of the property itself. The Chesapeake & Ohio agreement to invest $17,000,000 of profit in additions and betterments to the property should be welcomed by the operating management of the road, and by every class of security holder senior to the stockholders, with unmixed satisfaction. Stockholders, however, are also given a fair chance. If conditions are favorable and the hopes of the management are fulfilled there will be no necessity for cutting the dividend. If the dividend is cut it will be pretty good proof that the stockholders would sooner or later have had to make some sacrifice, and in railroad betterment work more than in any other line of industry the saying that "a stitch in time saves nine" is an understatement of fact rather than an overstatement.

THE SPIRIT OF THE FRISCO

WHILE the methods of financing the St. Louis & San Francisco have been severely condemned and the property will have to be reorganized to place it on its feet, there is an exceedingly bright side to the situation which argues well for the future usefulness and prosperity of that system. It is the remarkable progress toward more efficient and economical operation. This is not because of any addition to the equipment or to the improvement of facilities, much as they are needed. Rather is it due to a wonderful spirit of co-operation and enthusiasm which seems to permeate the organization. This is kept at a high pitch by the educational campaign which is being waged for more economical and efficient operation, and which is described in the article on "Studies of Operation—St. Louis & San Francisco" in this issue, insofar as it relates to securing better car loading and the hauling of heavier tonnage trains. In reality it is far more extensive than this.

The campaign is based on a firmly established idea that practically every man in the organization is not only willing, but anxious to perform his share of the work exactly as the management wishes to have it done. The difficulty is that too often the men are not properly instructed as to details or do not have an adequate idea of the value of their part in the work, or how they can increase their effectiveness. This means that the supervision will need to be more thorough and more intelligent and that there must be more of it. This is exactly what the management is trying to bring about, and the way in which it is accomplishing this will be made apparent by a series of articles on the Frisco, the first of which is published in this issue.

The employees are working for the Frisco and not for any one department. This was brought out in a pleasing way at a recent two-day meeting of about 175 officers, with Receivers Nixon and Biddle, at Springfield, Mo. In opening the first session an apology was made for the inadvertent use of the word "departments" in sending out the call for the meeting. To illustrate the co-operation between departments, the agent is responsible for the traffic in his district, as well as for the operation of the station, and it is not at all unusual for men in the roadway or mechanical department to lend their efforts in soliciting business for the company.

Then there is a strong spirit coming from the heads of the organization to do away with all fault finding. The desire is not to chastise a man when he is found doing a thing in a wrong way, but to get busy and show him how to do it the right way. It is no disgrace to do a thing wrong if you have not been told how to do it right. The men are encouraged, if they think they are not getting the best results, to talk over the work with their superiors in order to be set right. Criticism in all cases must be constructive, not destructive.

All this means that the supervising officers must keep in close personal touch with those under them. Superintendents, for instance, are urged to run their business cars special in the direction opposite to that of heavy traffic. By doing this there will be no additional expense for the engine and train crews, since they would have to run light in any event, and they may spend more time at the stations, and be there when the employees are not rushed with work taking care of a passenger train. The effort is to get each officer or foreman to study carefully the men under him and to really know them. In this way only can the individual efficiency of each employee be brought to the highest point, and the efficiency of the organization as a whole depends on the efficiency of its individual members. If a man must be discharged it is a sign of poor discipline or training, or a mistake in the selection of that man. More care is therefore being given to the selection of men, and in this lies one of the greatest possibilities of future prosperity of the system.

Added to this spirit we find each department vying with the others in its efforts to introduce more efficient methods; these things are largely responsible for the splendid showing that the receivers have made. Emphatically it is in no way due to any neglect in the upkeep of the property or eating into the vitals, as has been the case on some roads in the past. The Frisco physically is in better shape today than it was when the receivers took it over, for it has been necessary to make considerable improvements in order to handle the traffic more safely and economically.

THE ST. PAUL'S MISSTATEMENT OF ITS ACCOUNTS

UNLIKE the Interstate Commerce Commission's investigation of either the St. Louis & San Francisco or the New York, New Haven & Hartford financial tangles, Commissioner Harlan's report of the investigation of the Chicago, Milwaukee & St. Paul and the Chicago, Milwaukee & Puget Sound accounts dispenses with vague phrases and meaningless generalities, and confines itself to three very serious charges. If these charges are true and are a comprehensive statement of facts as well as a statement of nothing but the facts, the St. Paul directors have been guilty of deliberately trying to misrepresent the company's earnings and expenses to its stockholders. The commission, in substance, accuses the St. Paul directors of:

Including in the income account of the St. Paul itself for 1910 all of the income which that company had a right to from the transportation of materials for the construction of the Puget Sound prior to July 1, 1909, thereby misstating this income by over $4,600,000, and further aggravating this offense by giving an untrue explanation of the apparent falling off in revenue in 1911.

Including in the cost of construction of the Puget Sound certain interest items accruing after August 1, 1909, which should have been charged to income and which overstated the net income of the Puget Sound for 1909 by nearly $500,000, and this overstatement was augmented by charging for the transportation of materials for branch line construction rates substantially higher than those published by the Northern Pacific.

Showing on the balance sheet of the Puget Sound a property investment account greater by $100,000,000 than was the fact.

President Earling has given out a statement in which he explains the addition of the $100,000,000 to the assets of the Puget Sound and attempts to excuse the other charges which the commission makes. The laws of Washington provide that a railroad company cannot issue bonds to the face value of more than twice the par value of its outstanding stock. The Puget

Sound was financed through the sale of St. Paul stock to its own stockholders and additional money was later raised by the sale to the public of $25,000,000 Puget Sound bonds. The St. Paul directors, unwilling, however, to accept stock ownership as the binding security for the advances made by the St. Paul, had the Puget Sound company, a Washington corporation, issue first mortgage bonds up to about the full extent of the construction cost, roughly, $200,000,000. To be within the Washington law the Puget Sound also had to issue $100,000,000 stock. Since this stock was issued to the St. Paul and carried on its books at merely a nominal value, from the point of view of the St. Paul stockholders there was no deception here; but although it is probably true, as President Earling says, that the Puget Sound company's accounts had to show this stock as a bona fide issue, we do not know of any provision in the Washington law which would have prevented one of two courses—either a statement under deferred assets on the Puget Sound balance sheet showing discount on securities sold of $99,999,000 and only an investment of $200,000,000 in road and equipment, which would have brought its accounts into conformity with the Interstate Commerce Commission's requirements, or a note attached to the balance sheet stating that since the requirements of the Washington law and what were considered the necessities of the situation were at variance with the Interstate Commerce Commission accounting regulations, the property account of the St. Paul was not in accordance with the commission's prescribed rules.

President Earling tries to excuse the other two charges of the commission by saying that the accounting practices of the company are being brought into conformity with the commission's regulations, and the commission, in its report, says that the St. Paul explained these matters by placing the burden of them upon the "negligence, inattention and lack of familiarity on the part of its comptroller and those under him with the requirements of the commission." The comptroller died in 1913. If the comptroller took such responsibility as this without knowledge and authority of his directors, the directors and the president of the road must have been woefully lax in their duties of supervision.

The charge that is being made most of by the newspapers is that the company watered the assets statement of the Puget Sound to the extent of $100,000,000. It seems quite unlikely that there was any real intention to deceive stockholders or the Interstate Commerce Commission. A questionable device for complying with the laws of the state of Washington is about the full measure of the offense.

The first charge, however, is of an entirely different nature. It was legitimate for the St. Paul to include in its income account charges for the materials hauled for use in the construction of the Puget Sound. Apparently the directors during the years prior to 1909 thought that this was not the best course and did not include such amounts in the income for these years. In 1910 the St. Paul could not show its dividend as having been earned from the revenue of that year. Apparently in casting about for some means of getting out of a tight hole the scheme of including in *that* year's income, amounts which could legitimately have been included in previous years' income accounts, was hit upon. Arguing, possibly, that whether this $4,600,000 was credited to this year's income or to profit and loss this year, as an adjustment not previously taken into the company's accounts, was a mere technicality and could do no harm to anybody, while the showing of a payment of a dividend not earned in that year would be an actual practical loss to the company through the depression of its credit, the company decided to follow its own accounting method rather than that of the commission. The answer to such an argument is that in this case the commission's systems of accounts would have stated the facts and the company's failed to do so; but even more to be regretted is the following clear-cut accusation of the commission:

As the result of this overstatement of income for the fiscal year ending June 30, 1910, the report of the St. Paul company for the succeeding year showed an apparent falling off in revenue and income as compared with the previous year of over $2,000,000. In its report to its stockholders for the latter year the explanation offered by the officers of the company was that "the large decrease in the net operating revenue is accounted for by the inability to obtain increased rates and the great increase in the cost of labor." This statement was not in accordance with the facts in the case. . . . The reference to "the great increase in the cost of labor" was no less at variance with the real facts. In its report to this commission for the year ending June 30, 1910, the St. Paul company, under the heading "employees and salaries," shows the following tables:

Number of employees June 30, 1910, excluding general officers	56,658
Total yearly compensation	$30,998,418.73
Average daily compensation	$2.23

The report for the fiscal year ending June 30, 1911, gives the corresponding statistics for the year, as follows:

Number of employees June 30, 1911, excluding general officers	40,083
Total yearly compensation	$30,942,724.10
Average daily compensation	$2.27

It has become so much a matter of course for railroad presidents to include some such sentence as "the property has not only been fully maintained but improved in condition" or "the increased cost of operation is due to increases in wages, etc.," that it would probably be a surprise to some railroad officers that anyone would expect them to go back and make an analysis of the facts.

A great part of the trouble with the St. Paul seems to have been that the directors were afraid that the public and its own security holders were not grown up enough or courageous enough to be told the truth. A clear, vigorous exposition of misleading statements in regard to financial conditions of railroad companies such as this report on the St. Paul will do more to help prevent a bill to hamper the issuance of securities by railroad companies than will all the arguments that can be presented at Washington by the most expert railroad financiers in the country. It is too bad that the commission's report could not have been made a few months after the close of the fiscal year 1910 instead of nearly four years later. If it had been made four years ago the commission would have manifested more diligence in the performance of its own duties, and the report would have appeared at a time when it probably would have done less harm to railways in general and more good.

"IMPARTIAL" STATE COMMISSIONS

RAILWAY officers often complain that state railway commissions are unfair. These complaints usually are resented by the commissions, and taken with large allowances by the public. When the roads appeal from state commissions to the courts they are not infrequently denounced for resisting public regulation. But developments are occurring all the time which illustrate why the railways regard certain of the state commissions as unfair and are engaged in almost constant struggles with them.

It is well known that the Texas commission has for years subjected the roads in that state to stringent regulation. It has issued many orders which have increased their expenses, and at the same time has consistently held down and reduced their rates. A short time ago the railways asked the commission to give them a hearing on the question of advancing their freight rates. The commission replied that there was no merit in the petition of the roads for higher rates, and therefore refused them a hearing. Just how the commission found out that there was no merit in the railways' petition when it had not heard the evidence which they desired to present to it is not known.

Very similar is the attitude assumed by certain of the western state commissions regarding proposed advances in interstate rates. The western lines have not yet asked for permission to advance their interstate rates. But the eastern railways have, and no doubt if their application should be granted the western roads would present a similar petition. Apparently in anticipation of this possibility members of the state commissions of Missouri, Nebraska, Kansas, North Dakota, South Dakota and

Iowa met in Kansas City recently and adopted resolutions opposing any advance in rates. At the same time they appointed one of their number to appear before the Interstate Commerce Commission and present their views.

Now, railway and public utility commissions are supposed to be both administrative and quasi-judicial bodies. In their administrative capacity they are required to enforce the laws passed for the regulation of public utilities. The most important of their quasi-judicial duties is to determine the reasonableness of existing or proposed rates. The various laws creating the commissions and defining their duties provide that as a means to the determination of the reasonableness of rates they shall give hearings to all interested parties and shall prepare reports setting forth their conclusions and the grounds on which they are based. It is assumed in all of the laws that in the performance of their quasi-judicial duties the commissions will be fair and impartial; that they will give all parties a full opportunity to be heard, and that they will base their decisions upon the facts presented to them.

Suppose, now, that in due time the Interstate Commerce Commission should authorize the western roads to advance their interstate rates, and that, as would doubtless happen, they should appeal to the state commissions for permission to advance their state rates. In many cases permission to advance their interstate rates would be valueless without permission to advance the corresponding state rates. On the theory of the law and of fair regulation it would then be the duty of the state commissions to give them full and impartial hearings, and to settle the question raised according to the nature of the evidence presented. But members of the state commissions of Missouri, Nebraska, Kansas, North Dakota, South Dakota and Iowa having already met, and decided, and announced that the railways are not entitled to higher rates, how could they in future pass impartially on any petition that the roads might present to them?

There is sometimes complaint that the courts decide cases or issue orders on ex parte statements. These state commissioners have gone much farther. They have in effect decided and announced what action they would take on petitions for advances in rates without having heard either party. And they have apparently based their decisions chiefly on statistics compiled by one of their number who but a few months since, in a statement read before the National Association of Railway Commissioners, made a mistake of over $200,000,000 in the total amount of interest and dividends paid annually by the railways of the United States; and it is this accurate gentleman whom they have sent to appear for them before the Interstate Commerce Commission. Somewhat over three years ago this same gentleman—then a candidate for state railway commissioner—was appearing in the original rate advance hearing as the paid attorney—we assume he was paid—of the Corn Belt Meat Producers' Association. All of which is but further evidence of the absolute impartially of some state commissions and commissioners!

There is one way in which state commissioners might with propriety inject themselves into hearings before the Interstate Commerce Commission. This is as seekers for information which might be of value to them in their own subsequent consideration of similar questions. For state commissions to appear in proceedings before the Interstate Commission as parties is in vile taste, brands the commissions thus represented as packed juries, and indicates the unfitness for membership on a regulating commission of every commissioner in any way responsible for the adoption of such a course.

Is it any wonder, in view of such facts as the foregoing, that the railways are constantly appealing from certain state commissions to the courts, or that usually they succeed in getting the commissions overruled? Some of the old state commissions were severely and justly criticized because they were "owned" by the railways. Which are worse—commissions "owned" by the railroads, or commissions dominated by demagogues who decide cases before they are presented to them?

Letters to the Editor

A PRACTICAL METHOD OF TONNAGE RATING

Trenton, N. J., March 6, 1914.

To the Editor of the Railway Age Gazette:

The very able and instructive article on "Simplifying the Tonnage Rating Problem," in the *Railway Age Gazette*, of February 27, is probably as satisfactory a solution of the problem as it is possible to obtain by theoretical methods with our present imperfect knowledge of the subject; but it must be admitted that in a problem so complicated as this, the practical application of theoretical formula is subject to various inaccuracies, for it is quite impossible to express in a general formula all of the varying conditions involved. The only way to secure certainty in the result is by the measurement of the tractive force actually exerted in moving a train of known weight over the controlling point.

A general formula applicable to all cases is attractive, but actual measurement of the force exerted in the given case is more reliable and on that account preferable. The difficulties in the way of the application of a general formula are many. Among them are the uncertainty of an engine delivering its full tractive effort at the critical period, for instance when near the summit of a long grade; the uncertain amount of the internal resistance of the engine; the uncertain element of curve resistance which has never been satisfactorily determined and perhaps cannot be adequately expressed in a formula; the uncertain amount of flange and center bearing resistance which varies considerably in different classes of cars. All these elements of uncertainty are largely eliminated by the use of the dynamometer. We obtain at once the actual data that we want to know.

The simplest and most satisfactory method is to run the dynamometer car next to the engine on a sufficient number of trains in regular service, making no selection of cars other than daily practice affords, and running the train under ordinary service conditions, taking care however to move the trains over the ruling point at as nearly a uniform speed as possible, which speed may be selected in advance as the speed most desirable to be maintained in practice.

A very few trials will develop the available capacity of the engine; that is the average maximum tractive effort that can be relied upon in daily performance. Then, taking the record for each trip, dividing the total resistance as given by the dynamometer and the total weight of the train as given by the waybills, and plotting the quotients on a diagram, the proper car factor and tonnage rating may be determined directly therefrom

A reference to a former article in the *Railway Age Gazette* of October 22, 1909, will show the relation of the rating and the car factor to the resistance curve and the mathematical significance of the adjusted tonnage rule.

The fact that by this method the rating and the car factor are determined under regular working conditions, and quite independently of theoretical considerations is a strong argument in favor of the use of the dynamometer, and beyond any doubt a closer approximation to the maximum engine load can be reached in average daily performance than in any other way.

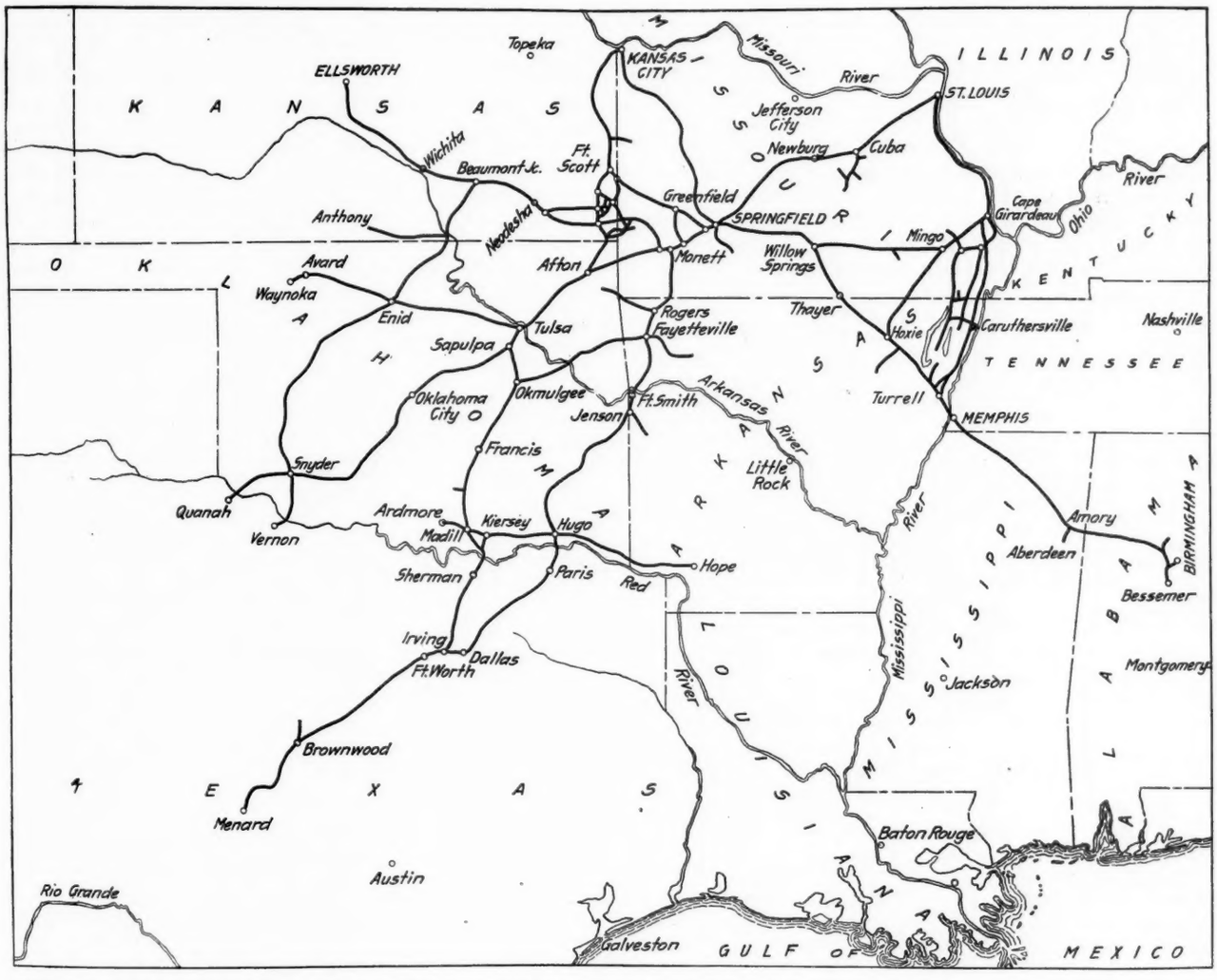
Alex. P. Gest.

Through Railway Tickets from England to Spain.—The London, Brighton & South Coast and the French state railways have announced that through tickets from London to Spain and Gibraltar via Paris and Irun will be issued upon application to the continental traffic manager of the London, Brighton & South Coast at London. The holders of these tickets will be allowed stopovers at all intermediate stations in England, France and Spain.

Studies in Operation—St. Louis & San Francisco

Remarkable Results From an Educational Campaign for Heavier Freight Trains and Better Car Loading

The St. Louis & San Francisco serves a section of the country with most diversified interests, many of which are in a state of development. They include the oil fields and agricultural districts in Oklahoma, the iron, steel and coal mining industries in northwestern Alabama, the cotton section in Oklahoma, Alabama, Arkansas, southeast Missouri, and northern Mississippi, the zinc mines in Missouri, the coal fields in Kansas, Arkansas and Oklahoma and the agricultural and timber districts in the several states on its lines. Within recent years a considerable number



Map of the St. Louis & San Francisco, Including the North Texas Lines, Which Lie South of Paris, Tex., and Sherman, and Are Under a Separate Receivership

of important manufacturing industries have been located at various points on the system. It is not surprising, therefore, to note that although the mileage operated during the past nine years has increased from 5,030 to 5,255, or 4.4 per cent. (Table I), and the average tractive effort of the locomotives has increased from 22,913 to 27,957 lbs., or 22 per cent., the average load in tons per train of net revenue freight has increased from 199.6 to 281.4, or almost 41 per cent. During this time the revenue freight ton miles has increased 56 per cent.

The prospects are for even a more rapid future development of the district covered by the Frisco. As the density of traffic increases it will be possible to still further increase the average train load, tending toward a greater economy in the cost of conducting transportation. Much more than this natural tendency toward economy is possible, however. The Frisco in developing its traffic made it a point to give prompt service, and too much attention was paid to high speed freight traffic under the belief that this was necessary in order to successfully meet competition. Moreover, the possibilities of higher tonnage trains and better car loading have been limited until comparatively recently because of the light density of traffic. In analyzing conditions in their efforts to secure greater economy the receivers, profiting by the experience of some few of the other roads, decided last September to wage a determined campaign toward heavier tonnage trains and better car loading. This move met with most excellent results.

One of the diagrams shows the freight traffic density and direction on the Frisco for the year ending June 30, 1913. The boxes with the cross-section lines, placed on either side of the line of the road, show graphically the density of the traffic in either direction as indicated by the arrows, while the figures

express it in terms of 100,000 net tons hauled one mile per mile of road. The freight traffic density on parts of the system compares favorably with that on some of the larger eastern roads, but the large mileage of branch and tributary lines brings the average down. In addition it should be noted that much of the mileage, and particularly that serving the heavier traffic, is divided between these services on some arbitrary basis. The items considered are shown in detail in Table IV. For these items alone the saving in November, 1913, as compared to the same month for the previous year, amounted to $42,823 on the basis of the net ton miles handled. The total saving must have been larger than this, but just how much it is impossible to

Table I.

Year	Average mileage operated	Revenue freight, tons carried	Revenue freight, ton miles	Average miles carried	Rate per ton per mile (Cents)	Average load in net tons per train*	Average load in tons per loaded car	Average tractive effort of locos. in road service
1905	5,030	12,793,075	1,999,624,091	156.3	1.005	199.6	15.65	22,913
1906	5,069	13,848,992	2,306,200,334	166.5	0.952	214.5	15.94	23,471
1907	5,062	16,154,154	2,658,150,453	164.5	1.010	224.4	16.90	24,273
1908	5,064	15,275,619	2,465,448,295	161.4	0.972	212.3	17.13	24,907
1909	5,073	15,952,144	2,518,944,746	157.9	1.003	220.8	16.93	24,949
1910	5,072	17,829,713	2,829,482,793	158.7	0.977	222.9	17.14	25,927
1911	5,188	17,128,446	2,675,695,200	156.2	1.049	220.9	15.98	26,864
1912	5,241	16,985,882	2,714,876,424	159.8	1.013	255.2	16.15	27,166
1913	5,255	19,739,790	3,126,717,306	158.4	1.000	281.4	17.13	27,957

*These figures include the North Texas lines which are under a separate receivership.

through the semi-mountainous regions of the Ozarks and the southern Appalachians.

WHAT HAS BEEN ACCOMPLISHED?

The last lot of new freight locomotives was received during September, 1912, and the early part of October, so that the power in service during the past three months and the greater part of the month of October was practically the same as that of a year ago. The results during the last three months of the calendar year 1913 and January, 1914, as compared with the same months for the previous year, are shown in Table II.

Table II.

Month	Freight train miles, revenue		Gross ton miles		Gross tons per train mile		Net tons per train mile†		Per cent. of net to gross		Variable transportation costs directly chargeable to freight service*		Cost per 1,000 gross ton miles*		Cost per 1,000 net ton miles		*Savings made in transporting 1913 ton mileage on basis reduced cost for	
	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	Gross ton miles	Net ton miles
Sept..	860,683	875,321	703,538,380	669,941,341	817	765	345	335	42.2	43.8	$413,643	$433,356	$.5879	$.6469	$1.3946	$1.4788	$41,508	$24,974
Oct...	853,153	956,588	726,361,218	728,101,923	851	761	368	334	43.2	43.9	429,885	479,210	.5918	.6582	1.3696	1.4977	48,230	40,208
Nov..	808,581	907,181	709,017,320	707,314,105	877	780	389	344	44.4	44.1	417,000	455,250	.5881	.6436	1.3243	1.4603	39,350	42,823
Dec...	745,191	880,561	620,663,451	683,575,065	833	776	359	334	43.1	43.1	399,063	446,477	.6429	.6531	1.4907	1.5183	6,321	7,389
Jan...	803,729	879,552	691,694,237	671,824,867	866	764	365	319	42.4	41.7	400,308	450,240	.5787	.6702	1.3636	1.6070	63,290	61,453

* The items considered are only those variable costs which may be directly charged to the freight service and include wages of enginemen and trainmen, fuel, water, locomotive lubricants, other locomotive supplies and train supplies. They are shown in detail in Table IV.

† These figures do not include the North Texas lines and include company as well as revenue freight.

During November, for instance, the revenue freight train miles decreased very nearly 100,000 miles as compared to the same month for the previous year. At the same time there was an increase in the gross ton miles, the average gross tons per train mile having jumped from 780 to 877 tons, or more than 12 per cent. In order to give some measure of the possible savings which result from this improvement we have secured data as to those items in the cost of conducting transportation which are directly chargeable to freight service. These do not include any of the overhead or fixed charges, or those which refer to both freight and passenger service, and are usually state with any degree of accuracy. The important thing is that so great a saving was made when the work had hardly been well started. A study of the conditions at present obtaining on the system, and the methods which are being developed to take advantage of the possibilities of improvement, indicate that a much larger saving will be made during the coming months.

Business fell off considerably in December, as it did on most other roads throughout the country, and the saving compared to the same month during the previous year when business conditions were better, was much less than during November. Conditions improved very considerably during January, with a marked increase in the savings per net ton mile. It will be noted from Table III that the car loading increased from 20.78 net tons per loaded car mile in December, 1912, to 21.53 in 1913.

Table III.

Month	Loaded car miles		Empty car miles		Total car miles		Per cent. of empty car miles to total car miles		Average net tons per loaded car mile	
	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912
September	14,429,134	14,607,749	6,378,862	5,189,879	20,807,996	19,797,628	30.66	26.21	20.56	20.06
October	15,402,493	15,782,234	5,997,919	5,432,935	21,400,412	21,215,169	28.03	25.59	20.38	20.26
November	14,367,643	14,862,799	5,615,971	5,403,103	19,983,614	20,265,902	27.96	26.66	21.91	20.98
December	12,431,119	14,149,417	5,682,315	5,947,698	18,113,434	20,097,115	31.37	29.60	21.53	20.78
January	13,608,551	13,866,288	6,572,412	6,270,243	20,180,963	20,136,531	32.57	31.13	21.57	20.20

One of the most important factors in increasing the net tons per train mile is to reduce the empty car miles. This is exceedingly difficult to control, depending as it does on the balance of traffic and upon the surplus or shortage of cars. Every effort is being made to originate business which will prevent the light hauling of cars in a direction opposite to that of heavy traffic, but the possibilities in this direction are limited. It is surprising, however, how much may be done in this direction by

Table IV.

Month	Wages of enginemen		Wages of trainmen		Fuel		Water		Locomotive lubricants		Other locomotive supplies		Train supplies and expenses		Total	
	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912	1913	1912
September	$105,782	$105,227	$128,026	$131,159	$143,736	$161,799	$12,057	$11,769	$2,623	$2,030	$2,855	$2,972	$18,564	$18,400	$413,643	$433,356
October	107,361	117,124	128,687	140,604	156,766	168,270	12,094	13,068	2,474	2,399	2,656	3,209	19,847	34,536	429,885	479,210
November	102,856	110,657	126,794	135,492	153.345	169,664	11,780	13,374	2,168	2,192	2,493	3,039	17,564	20,842	417,000	455,250
December	98,819	108,119	119,818	129,641	145,123	175,628	11,730	13,720	2,965	2,529	1,139	2,847	19,469	13,993	399,063	446,477
January	122,256	129,103	100,925	109,261	146,720	176,597	11,399	15,825	2,480	2,421	2,655	3,176	13,873	13,857	400,308	450,240

giving the problem careful attention. When business is light and there is a surplus supply of cars, it is cheaper to light haul foreign cars in the effort to return them promptly to the owners than to pay the per diem charges.

It would not be fair to ascribe all of the increase in the average train load to the special efforts which have been put forth in that direction, although the larger part of it is undoubtedly due to that effort. As the district traversed by the Frisco has developed it has become possible to secure greater train loads and there has been a natural increase in the tons per train mile each year because of this growth and regardless of the introduction of more powerful locomotives. True, the increase during past years has been aided by the addition of new and more powerful locomotives, but, as has been stated, no additions of this kind have been made since September, 1912, and the early part of October.

WHAT FACTORS ARE INVOLVED?

Roughly speaking, the cost of conducting freight transportation may be divided into those items of cost which, within reasonable limits, are fixed regardless of the amount of traffic handled, and those which vary as the amount of business changes. To reduce the fixed cost per unit of traffic, more units of traffic must be handled; in other words, more business must be secured. Where there is competition the business may be increased by giving better and more regular service than competitors, and by maintaining an organization which keeps in close touch with the shippers and receivers of freight in order to secure that co-operation which will serve the best interests of both parties. Where there is no competition it is just as necessary to give good service, to study the needs of the communities and to keep in close touch with the public, for the railroad more than any other factor can help to build up and develop the territory it serves, with resultant benefit to itself.

The agency plan on the Frisco which makes the operating officers responsible also for the traffic on their divisions and thus greatly increases the responsibilities of the agents and forces them into more intimate and favorable contact with the public, is one means of attaining this end and will be described in a later article. The department of development whose business it is to attract industries to locate on the line, to help the farmers to increase the returns from their lands, and to attract desirable settlers, is another factor which has been built up along unique and most successful lines and will also be described in a later article.

Then there is the department which handles loss and damage claims, and by its prompt and intelligent work is doing much to promote a better feeling on the part of the public, as well as to decrease the direct loss to the company by seeing that the goods are more carefully loaded and handled.

These means of building up the business and establishing it

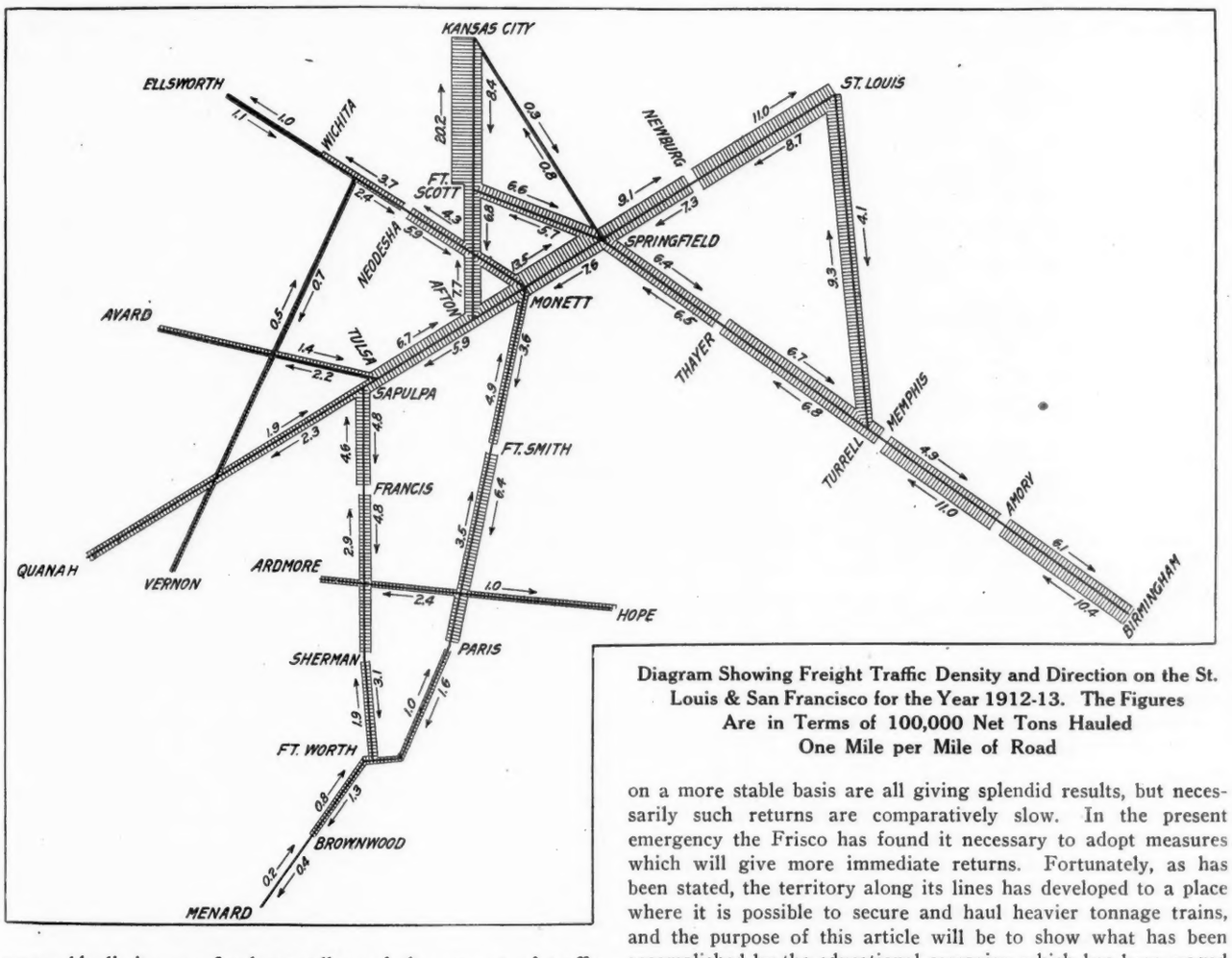


Diagram Showing Freight Traffic Density and Direction on the St. Louis & San Francisco for the Year 1912-13. The Figures Are in Terms of 100,000 Net Tons Hauled One Mile per Mile of Road

on a more stable basis are all giving splendid results, but necessarily such returns are comparatively slow. In the present emergency the Frisco has found it necessary to adopt measures which will give more immediate returns. Fortunately, as has been stated, the territory along its lines has developed to a place where it is possible to secure and haul heavier tonnage trains, and the purpose of this article will be to show what has been accomplished by the educational campaign which has been waged during the past few months to haul full tonnage trains and secure better car loading.

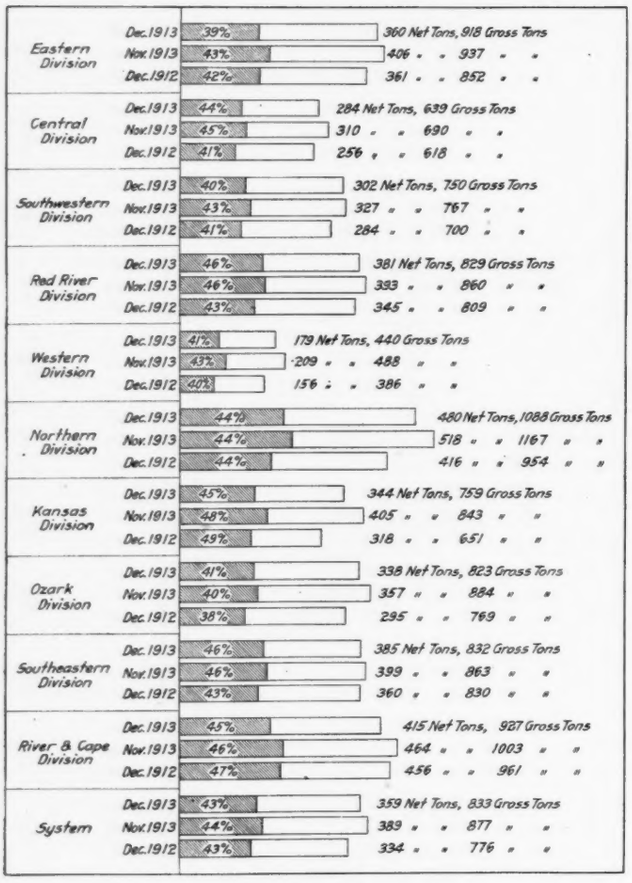
Under the head of transportation expenses other improvements than those mentioned above are being made along definite lines, but space will not permit of these being treated in this article. They will be considered in later issues and will cover improvements which are being made in fuel economy, telegraph operation and the handling of engine and train supplies.

Greater efficiency is also being secured in the mechanical, stores and purchasing departments, which are not included under cost of conducting transportation, and these will also be considered in

the series of articles of which this is the first. It should be clearly understood that these improvements are not being made in a short-sighted manner, but are part of a constructive program to build up the property and secure greater efficiency and economy in operation.

THE EDUCATIONAL CAMPAIGN.

In a very great degree the higher tonnage trains and better car loading are the results of an active educational campaign which has been carried on among the officers and employees of the company. In order that this work may be better understood its progress will be briefly reviewed and then the nature of the educational meetings which have been held will be described in detail. It was assumed as a fundamental principle that every employee is desirous of doing as the management wants if they


Eastern Division
Dec. 1913 39% 360 Net Tons, 918 Gross Tons
Nov. 1913 43% 406 " " 937 " "
Dec. 1912 42% 361 " " 852 " "
Central Division
Dec. 1913 44% 284 Net Tons, 639 Gross Tons
Nov. 1913 45% 310 " " 690 " "
Dec. 1912 41% 256 " " 618 " "
Southwestern Division
Dec. 1913 40% 302 Net Tons, 750 Gross Tons
Nov. 1913 43% 327 " " 767 " "
Dec. 1912 41% 284 " " 700 " "
Red River Division
Dec. 1913 46% 381 Net Tons, 829 Gross Tons
Nov. 1913 46% 393 " " 860 " "
Dec. 1912 43% 345 " " 809 " "
Western Division
Dec. 1913 41% 179 Net Tons, 440 Gross Tons
Nov. 1913 43% 209 " " 488 " "
Dec. 1912 40% 156 " " 386 " "
Northern Division
Dec. 1913 44% 480 Net Tons, 1088 Gross Tons
Nov. 1913 44% 518 " " 1167 " "
Dec. 1912 44% 416 " " 954 " "
Kansas Division
Dec. 1913 45% 344 Net Tons, 759 Gross Tons
Nov. 1913 48% 405 " " 843 " "
Dec. 1912 49% 318 " " 651 " "
Ozark Division
Dec. 1913 41% 338 Net Tons, 823 Gross Tons
Nov. 1913 40% 357 " " 884 " "
Dec. 1912 38% 295 " " 769 " "
Southeastern Division
Dec. 1913 46% 385 Net Tons, 832 Gross Tons
Nov. 1913 46% 399 " " 863 " "
Dec. 1912 43% 360 " " 830 " "
River & Cape Division
Dec. 1913 45% 415 Net Tons, 927 Gross Tons
Nov. 1913 46% 464 " " 1003 " "
Dec. 1912 47% 456 " " 961 " "
System
Dec. 1913 43% 359 Net Tons, 833 Gross Tons
Nov. 1913 44% 389 " " 877 " "
Dec. 1912 43% 334 " " 776 " "

Comparative Gross and Net Tons per Train Mile by Divisions for December, 1913, Compared with the Previous Month and December, 1912

know exactly what is wanted and how it is to be done. The idea then was to so improve the supervision that all concerned would not only understand just what was required of them, but would be inspired to secure better results because of the knowledge on their part of just what their increased efforts would mean to the company in dollars and cents. As an example, many operating officers and their immediate assistants are not well enough posted on the cost of transporting freight, and the returns received therefrom, to even roughly calculate the expense of moving a train of any size over a division, or the average profit for any given movement. They do not realize, and are not able to calculate, what the addition of a ton or two of lading to each of the cars, or the addition of a loaded car to a train would mean. They therefore lack the keen interest in their work, which is characteristic of the man in business who knows the cost of producing and selling each article which he handles, as well as the exact profit which will accrue from each transaction. There is no good reason why, in a rough way, the division superintendent, the yardmaster, the conductor or any member of the staff should not be able to do this in a simple way which is accurate enough for all practical purposes. The yardmaster, the despatcher, the trainmen and the enginemen are the men who actually handle the business, and they must be with you if you want the very best results.

The plan on the Frisco was to first get together the superintendents and the assistant superintendents and show them exactly how this could be done and the importance of so doing, in order that they in turn might hold similar conferences with their assistants and subordinates and thus pass the information down the line to the men who actually make up and operate the trains.

The assistant general manager called the superintendents together in September and went over the matter thoroughly with them. A campaign was immediately started. No schedules were lengthened except the high speed banana and meat runs; some of this business was lost and it was probably best that this was so. This class of traffic has to be rushed over the road at high speed, and the cars weighing about 23 or more tons only haul 10 tons or so of lading. In most cases these heavy cars have to be sent back over the road empty and at a good speed. The rate received for handling the traffic is not commensurate with the service given, and this is especially true on a single track line with heavy traffic, since the other business is more or less interfered with in order to give preference to the special high speed trains. In a few instances it was found possible to reduce the number of trains without affecting the service, each case being carefully investigated before action was taken. By better and more intelligent car loading it was found possible to cut out 100 merchandise cars each day.

A seven-day comparative statement was issued, including data for the through and local trains, for each division and in both directions, as to train mileage, car mileage, net tons one mile, net tons per train mile, gross tons one mile and gross tons per train mile, average engine rating per train mile, and per cent. of rating hauled. If especially noteworthy progress was made on any division, a pink telegram (sent only by officers and taking precedence over all other messages) was sent to the division superintendent, thus further encouraging the division for its good work. Several forms of graphical charts were developed to show the progress which was being made, two of which are shown in the illustrations.

The assistant general manager spent much of his time on the road visiting division points and holding educational or "get together" meetings. Possibly the most effective work at these meetings was an examination of the waybills in the office and a study and discussion of them on the part of those present. It is surprising how much interest can be stirred up in this way by taking concrete instances and showing just what results from poor or good car loading. The dates on the bills also show where delays have taken place, and weak places in the operation of the division or the road may thus be located and corrected. Specific instances of the use of the waybills in the educational campaign will be given in the latter part of this article.

The results of this campaign were almost immediate and steady improvement has been made ever since it was started; in fairness to all concerned the fact must be emphasized that the work is little more than well started at the present time, but has gone far enough forward to show that many important economies still remain to be instituted. In addition to the meeting which was held at Springfield in September, two other meetings of the superintendents were held at that place, and on January 19-20 a two-day meeting of about 175 of the operating, traffic, mechanical department and other officials was held at Springfield at which Receivers W. C. Nixon and W. B. Biddle were both present, and further improvements were discussed in detail. Meanwhile each of the division superintendents has been furthering the educa-

tional work on his division by reaching out and getting as many of his assistants and subordinates interested as possible.

The net result of these efforts was a reduction of 10 per cent. in train miles, which, of course, made less work for the train crews. In addition, the switching charges for service at terminals was greatly reduced. So thoroughly have the men entered into the spirit of the work that although it was necessary to set back engineers and conductors in some cases, and fewer brakemen and firemen are required, no complaint has been made.

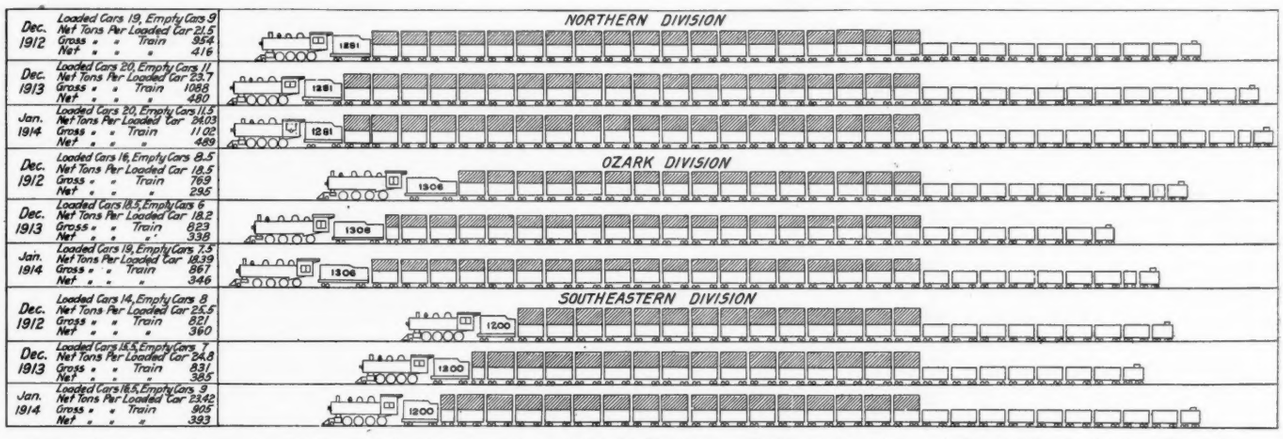
EDUCATIONAL MEETINGS.

In order that the nature of the divisional educational meetings may be clearly understood, the following account of what is really a composite of several such meetings is given. These included one at Fort Scott, Kan., at which 13 were present, including the superintendent, two assistant superintendents, assistant superintendent locomotive performance, two chief despatchers, yard clerks, car foreman, general yardmaster, special agent and chief clerk to superintendent; one at Sapulpa, Okla., at which were present the superintendent, superintendent locomotive performance, master mechanic, agent, yardmaster, representative of the supply department, general foreman, car foreman, despatcher, yard clerk and freight house clerks; one at Francis, Okla., at which 30 were present; one at Hugo, Okla., at which seven were present; one at Fort Smith, Ark., at which 14 were present; and one at Birmingham, Ala., at which 42 were present, including a number of enginemen and conductors.

men and inspire them to give better service. Of course, the added car would cause some slight increase in the amount of fuel used on the trip, but it would be so small as to be negligible.

After introducing two or three concrete examples of this sort, being careful to word them in terms of the places, commodities and equipment most familiar to those at the meeting, the figures on the latest seven-day comparative statement can be discussed to good advantage. Suppose, for instance, that during a given period in 1912 a division carried 256 net tons per train mile, while for the same period in 1913 this had increased to 284. Then the average earnings per train mile in 1912 would be 256 $\times$ \$.0087 = \$2.23 as compared to 284 $\times$ \$.0087 = \$2.47 for 1913. This is a difference of \$.24 per train mile, and the total increased revenue for the same number of train miles may be obtained by multiplying the train miles by the increased earning per train mile. There would be some increase in the expense to offset part of this, but it would be small in proportion to the gain, assuming that the locomotives were not loaded beyond capacity and the item of overtime did not increase. With a large blackboard and the use of simple concrete illustrations of this sort much intelligent interest and enthusiasm may be awakened.

Better Car Loading.—The cost of handling freight trains may be divided into two general divisions—variable costs and fixed costs. The fixed costs can only be reduced per unit of work performed by increasing the amount of business, which is largely beyond the immediate control of the officers of the road, and depends on the development of the territory served and general


Dec. 1912
Loaded Cars 19, Empty Cars 9
Net Tons Per Loaded Car 21.5
Gross " " Train 954
Net " " " 416
NORTHERN DIVISION
1251
Dec. 1913
Loaded Cars 20, Empty Cars 11
Net Tons Per Loaded Car 23.7
Gross " " Train 1088
Net " " " 480
1251
Jan. 1914
Loaded Cars 20, Empty Cars 11.5
Net Tons Per Loaded Car 24.03
Gross " " Train 1102
Net " " " 489
1251
Dec. 1912
Loaded Cars 16, Empty Cars 8.5
Net Tons Per Loaded Car 18.5
Gross " " Train 769
Net " " " 295
OZARK DIVISION
1306
Dec. 1913
Loaded Cars 18.5, Empty Cars 6
Net Tons Per Loaded Car 18.2
Gross " " Train 823
Net " " " 338
1306
Jan. 1914
Loaded Cars 19, Empty Cars 7.5
Net Tons Per Loaded Car 18.39
Gross " " Train 867
Net " " " 346
1306
Dec. 1912
Loaded Cars 14, Empty Cars 8
Net Tons Per Loaded Car 25.5
Gross " " Train 821
Net " " " 360
SOUTHEASTERN DIVISION
1200
Dec. 1913
Loaded Cars 18.5, Empty Cars 7
Net Tons Per Loaded Car 24.8
Gross " " Train 831
Net " " " 385
1200
Jan. 1914
Loaded Cars 18.5, Empty Cars 9
Net Tons Per Loaded Car 23.42
Gross " " Train 905
Net " " " 393
1200

Reproduction of Part of a Diagram Showing Consist of Freight Trains for Different Divisions of the St. Louis & San Francisco

Among the most important things which are considered at these meetings are measures for securing better tonnage trains and loading the individual cars more nearly to their capacity. If many of the enginemen and trainmen are present it is the practice to first explain briefly but clearly the meaning of gross ton miles and net ton miles, and to illustrate these terms by concrete examples.

Heavier Tonnage Trains.—The annual report of the Frisco for the year ending June 30, 1913, showed a rate of one cent per revenue ton mile for freight. Thirteen per cent. of the net tons carried was company freight for which no revenue was received. Considering a freight train, therefore, and assuming that it carried its proportion of company freight, each ton of lading would give a return of 13 per cent. less than one cent, or 8.7 mills. This, of course, is an average figure, but for rule of thumb purposes it is substantially correct for ordinary conditions. For instance, if the train crew realized that when the conditions were favorable and they found it possible to add another car to the train, the added revenue would pay for the entire amount of fuel used on the locomotive in making the trip, they would study their work more closely in order to take advantage of such situations. Suppose that the added car contained 21 tons of lading and that it was carried over a 100-mile division. Then 21 x 100 x \$.0087 = \$18.27. The cost of fuel per train mile last year was \$.1818, or for 100 miles, \$18.18, or a little less than the amount saved by adding the car to the train. Such illustrations take hold of the business conditions. The variable costs, on the other hand, are within the immediate control of those who make up and handle the trains and care for the equipment. It is here that the greatest possibilities of quick returns in increasing the efficiency and economy lie. What are these variable costs?* For the year ending June 30, 1913, on the basis of cost per train mile, they were as follows:

		Cents
1.	Locomotive repairs, renewals and depreciation	9.81
2.	Enginehousemen's wages	2.17
3.	Enginemen's wages	11.66
4.	Fuel	18.18
5.	Oil and waste	.24
6.	Water (on basis of fuel consumption)	1.40
7.	Locomotive supplies	.29
8.	Trainmen's wages	14.62
9.	Train supplies	2.15
10.	Freight car repairs	20.62
	Total cost per train mile	81.14

NOTE.—Items 1, 5 and 7 are an average of all classes of locomotives in service, the cost for any one class not being available. Items 3, 4, 8 and 9 are actual figures for freight service. Items 3, 4 and 6 are based on engine mile statistics.

The average gross ton miles of freight hauled per train mile

*It should be noted that these variable costs do not agree with those mentioned in the earlier part of this article, which are shown in Tables II and IV. The variable costs considered above include items for locomotive repairs, renewals and depreciation, and for freight car repairs. Assuming that the equipment is kept in first class condition, these figures are fairly accurate when taken over the period of a year, but because of the conditions under which the repairs and renewals are made, they would hardly bear a proper ratio to the service performed when considered on the basis of any one month, and they therefore have not been considered in the figures used in the earlier part of the article which cover one month only.

for the same period was 787, so that the variable cost per gross ton mile was 81.14 cents, divided by 787, or .103 cents (for rough or rule of thumb purposes one-tenth of a cent is sufficiently accurate). The average net tons of freight per train mile was 323, and the variable cost per net ton mile was, therefore, .242 cents.

Just how may this information be used or applied in a concrete way to secure a greater interest in car loading? In examining the waybills at Ft. Scott, Kan., it was found that four cars, all consigned to the same destination, 480 miles distant, had been loaded at Hugo on the same day, and each one contained only 25 bales of cotton, weighing about 12,600 lb. Sixty bales could have been placed in each of the cars by loading them in two tiers. The cotton in the four cars could have been placed in two cars, thus saving the hauling of the dead weight of two cars (38 tons) a distance of 480 miles. As the variable costs per gross ton mile are about one-tenth of a cent, this would have resulted in a saving of $480 \times 38 \times \$.001 = \$18.24$. Even better results might have been obtained by using furniture cars for this class of loading, and undoubtedly some such cars were available. As cotton is not a carload lot commodity, it should have been loaded in a merchandise car if there was less than a car full. Also, instead of using box cars, which were in great demand, the cotton might better have been loaded in meat cars which were being returned empty over the same route.

In another case the waybill showed that 48,400 lb. of white oak ties were loaded in a 30-ton car. The road to which the ties were consigned would have been glad to receive the 17,000 additional pounds, which could have been loaded in the car. Meanwhile money was being wasted by not taking advantage of the greater amount of revenue tonnage which could have been hauled for the same dead weight. The exact loss could be calculated by the method used above, and it is the practice to do this on a blackboard at the division meetings.

Here are other concrete instances of bad loading, which an investigation of the waybills at one of the stations indicated in a rather forcible way. A 50-ton gondola car was loaded with 80,000 lb. of chats. There is no reason why the car should not have been loaded to full capacity, or 110,000 lb. The material was for company use as ballast, and the cubical capacity of the car was sufficiently large to much more than carry the full tonnage capacity of the car. By proper loading three cars would have carried more than four of the cars which had been underloaded, which would result in a very considerable saving, particularly as the material was being moved in the direction of heavy traffic. The actual loss to the company in cases of this kind was clearly shown by working it out in the same way as in the cotton loading illustration above. It must be understood that the railroad company buys the chats by the cubic yard for ballast, and that even if the car had been loaded beyond capacity the excess load could easily be shoveled off at the first scale point, where it could be used to more or less advantage. If a railroad expects the shippers to load the cars to capacity it must first clean its own house, and conditions of this sort should not be tolerated.

Other abuses which have been located and are being remedied include the light loading of coal cars with company scrap. This condition is particularly bad, since in most cases the scrap is moved in the direction of heavy coal traffic, while at the same time flat cars which could be equipped with temporary side boards from scrap coal car sides and thus carry the scrap are being moved light in the same direction.

As has already been noted, the better loading of merchandise cars in the early stages of the campaign resulted in the use of 100 less cars a day for the same amount of freight. Not only did this make a very considerable saving because of reductions in dead weight hauled, but it facilitated the handling and movement of the cars because of the smaller number, and cut down the charges for switching service at one large terminal—St. Louis—to the extent of $45 a day.

An agent at one point showed how by an expenditure of $200 or $300 it would be possible for him to consolidate merchandise shipments at his station and save 150 cars per month. This was developed by asking for suggestions at one of the local meetings.

Better car loading is equivalent to lengthening passing siding and yard tracks and the enlarging of the terminals.

Co-operation from Shippers.—The co-operation of shippers of material in carload lots is a most important factor in securing better carloading. If they are properly approached and are told just what better carloading means to the railroad, they are usually quick to grasp the situation and help to secure better results. And they are by no means the losers. Better carloading means fewer cars to haul and handle through the terminals, and this results in a more expeditious movement. An important part of the Frisco campaign is to keep the cars moving, with the idea of utilizing the equipment to the utmost. There is also no question but that in times of car shortage proper carloading will do much to improve conditions. The only way in which this may be accomplished, however, is to keep everlastingly after it; there should be no let up because cars are plentiful. Not the least important feature of the "get together" meetings is a discussion of the ways and means for getting the shippers interested in the campaign which is being waged for better carloading.

Distribution of Cars.—Instructions have been issued to the effect that each chief despatcher must get out of the office and cover part, at least, of his territory once each month. If this is done it will result, among other things, in a more intelligent distribution of cars and better car loading. For instance, on one division a train of ties was found in which eight out of ten cars were of 60,000 lb. capacity, while lumber mills almost within sight of where the ties were loaded were placing 30 and 40 tons of material in 80-ton cars. The larger capacity cars could have been loaded to capacity with the ties, resulting in a considerable saving to the company.

Too little attention is often given to the proper use of a car of a given capacity, and in the distribution of the cars not enough thought is devoted to placing them where their particular capacities may be utilized to the best advantage. A 50-ton box car may be loaded with light material, while a 30-ton car will be loaded at the same station with a class of lading which will overload it without utilizing its cubical capacity. Then, too, a 50-ton car loaded with company coal will often be consigned to a coaling station 10 or 15 miles from the mines, while a 30-ton car will be sent to a station several hundred miles distant. This is a most wasteful condition; the higher capacity car should in all cases be given preference for the longer hauls. An examination of the waybills shows up abuses of this kind, and the supervising officers are urged to make a practice of checking these bills frequently as they visit the stations.

Long Hauls.—Another way in which the agent can spend his time to splendid advantage in scrutinizing the waybills is to see how the routing could be improved to give the company the advantage of long hauls. Under the agency plan, which will be described in a later article, the agent is responsible for traffic as well as for operation, and he therefore takes a much greater interest in securing the most advantageous terms for his company.

Bad Order Cars.—A bad order car is no excuse for delaying the movement of a shipment. If the car is bad ordered in transit, then the railroad should use every effort to get it on the repair track, make the repairs and forward it without unnecessary delay. Team work between the yardmaster and the car repair foreman will often make it possible to repair and forward a car without missing its regular train, and the necessity of doing this is emphasized on every occasion. The employees must realize that the shipper is entitled to this treatment, and that like any other business it pays a railroad to give its patrons good service. If a car cannot be repaired within 24 hours, the load must be transferred; whether the car is held for repairs or

the load is transferred the shipment must be given preference over all shipments of the same class when it is ready to be forwarded.

More than this, however, is necessary. The cars before being loaded should be carefully inspected to make sure that they are fitted for the class of lading for which they are to be used, and any weakness which might result in the car getting into bad order should be corrected. The work which the Frisco has done in the selection of proper cars for loading grain, flour, cement, etc., is familiar to our readers. At one of the educational meetings the suggestion was made, and bids fair to be carried out, that similar precautions be taken to see that coal cars before being set out for loading are in such condition as to carry the load without delay or loss. This was suggested by an inspection of coal cars in the yards, several of which showed signs of having lost part of the lading because of defective construction; delays of such cars, as shown by waybills, because of getting into bad order, also emphasize the necessity of such a course. It is proposed to inspect each car before it is sent to the mine for loading and to have it carded, showing that it is in proper condition for such loading. The inspector who passes upon the car must sign his name on the card so that responsibility may be placed if the car fails in service.

Examination of the waybills at some places indicated either a lack of co-operation between the yardmaster and the car repair foreman, or the absence of proper interest on the part of these departments in seeing that bad order cars were properly repaired and forwarded. On the Frisco, date stamps are not only used on the waybills for showing the receipt of the cars at various terminals through which they are handled, but a special bad order date stamp shows just when a car has been made bad order. It is surprising how a study of the dates on the waybills will show up defects in the service, either in moving the cars from place to place or in making necessary repairs.

Reducing Accidents.—The accident record on the Frisco is high, and it is believed that there will be fewer accidents with the full tonnage trains running more slowly and at a more uniform rate. A campaign has been started to compel district observance of the maximum speed limits on the time card. The officers must be honest with the men in this regard and must not wink at violations. The men must be taken to account for any violation of these rules, and means are being taken to see that they are strictly lived up to; moreover, no variation above the limits will be excused. The designated maximum speeds will be the maximum speeds. The way to run fast is to cut out avoidable delays at the stations. This matter is being emphasized at the "get together" meetings.

VALUE OF EDUCATIONAL MEETINGS

The action of many of the officers and men who have attended the educational meetings give unmistakable evidence of the good which has been accomplished. Not only do they get a bigger and broader idea of the working of the organization as a whole, but the discussions often develop weaknesses in methods or equipment which are gone over carefully, and oftentimes the men return to their work with well defined ideas as to how to remedy these conditions.

One thing that was strongly emphasized at each one of the meetings was the value of constructive criticism. Officers and foremen should be careful when they find things which are wrong not to criticize in a destructive way, but should do so in a constructive way, knowing that it will be received in the spirit in which it is offered; they must be big enough to court constructive criticism. With this in mind, a division superintendent, for instance, if he finds underloaded or improperly loaded cars which originated on another division, should not hesitate to take it up directly with the superintendent of the division from which the cars were received. In other words, there must be a co-operative and constructive spirit in dealing with matters of this kind.

The officers and men are encouraged to talk frankly of their work, and if they realize that they have handled it in the wrong way, to frankly admit it and discuss measures for securing better results. It will not be held against them and they will be shown the right way of doing the thing which is in question. Too much attention has been paid to precedent. The story was told on one occasion of an Englishman who traveled through this country. He noticed a car inspector tap the car wheels with his hammer and each time cock his head to one side and look away from the wheel. Asked why he did so, he said, "Sure and I don't know—thim's the orders." There is too much of this fetich of precedent in the railway business. The men should be encouraged to think for themselves, to study their work more closely and to suggest ideas for improved service.

It has been observed that those divisions where educational or "get together" meetings are held frequently are more elastic than the other divisions, if that term may be used, and more prompt results are usually obtained from them when instructions are issued from headquarters.

On one division, which had had the banner record as to train loading for the previous month, the trainmen were very much interested in knowing how things were coming out the following month and asked for heavy tonnage loads. In going over the system it was not unusual when a freight train was met on a siding to have the conductor point with pride to the size of his train and comment on having a 100 per cent. load.

FREQUENCY OF EDUCATIONAL MEETINGS

It seemed to be the consensus of opinion at the general staff meeting which was held in Springfield, Mo., on January 19-20, that division staff meetings where all the members of the superintendent's staff are expected to be present should not be held oftener than once a month, but that meetings of the men at any one point might be held in a more or less informal way whenever the superintendent or his assistants found it convenient to call such meetings on their trips over the division.

CONCLUSIONS

It would be difficult to sum up the results of the hauling of heavier tonnage trains and of better car loading. In the short time that the effort has been under way a goodly saving has been made, as we have shown. A study of the advance made thus far and of the opportunities that are opening up as continued progress is made indicate that much still remains to be accomplished.

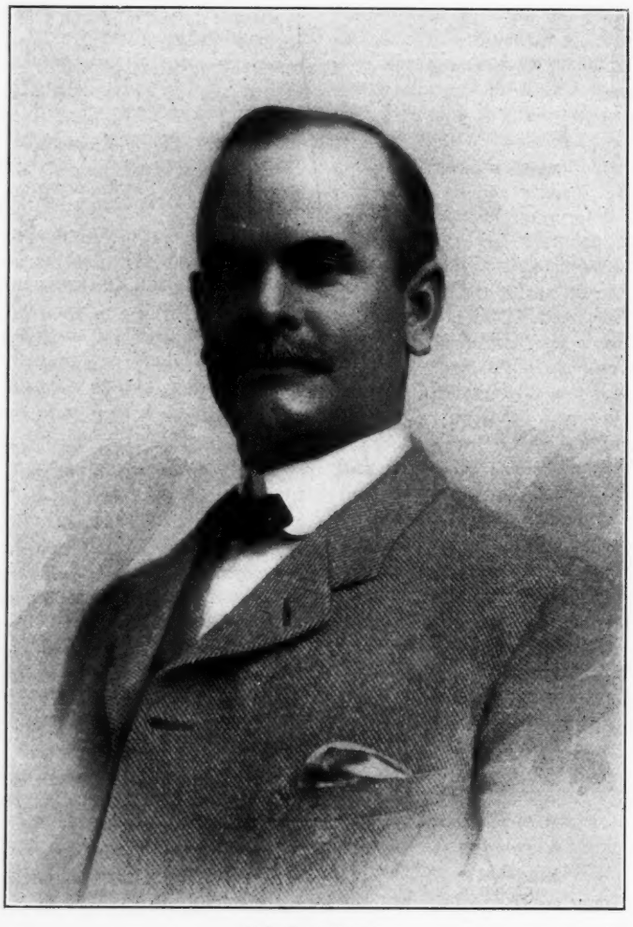
Some things are very apparent as the work progresses. It means greater intensity of effort, the breaking away from precedents and more intelligent work. Naturally the weaker spots in organization, methods and equipment are continually being developed. These must be corrected one by one, and so far as finances admit this is being done. The Frisco serves a country which has wonderful possibilities for development and it is doing its share in the upbuilding of these districts. Much needs to be done in improving its roadbed, equipment and facilities, but in the present financial straits the means for so doing will not be forthcoming until it can be clearly shown that these means will be utilized to advantage and will pay adequate returns. As far as operation is concerned, the Frisco has been considered a good road compared to its neighbors. The splendid progress which it is now making, not only in the matter under discussion but in other ways which will be considered in the series of articles of which this is the first, speaks well for the wise and efficient management of the receivers and for the future of the road.

MOTOR CARGO BOAT ON ENGLISH CANAL.—It is a common sight on the Leeds canal to see a fleet of canal boats drawn by a steam tug. A short while ago, however, a motor cargo boat was introduced. The boat had a carrying capacity of 70 tons, and on its first trip brought a cargo of cement which had come from London by steamer to Goole and had been transshipped there for carriage to Leeds. The boat was looked upon as a novelty at Leeds, and has been cited there as a sign of the revolution which may be expected in river and canal traffic.

W. A. GARRETT AND THE PERE MARQUETTE

W. A. Garrett, vice-president of the Chicago Great Western, has been appointed chief executive officer for the receivers of the Pere Marquette, with headquarters at Detroit, Mich.

Mr. Garrett will take to the Pere Marquette a wealth of experience fitting him to deal with the extremely difficult situation which presents itself to the management of this road. He entered railway service almost 38 years ago as messenger in a ticket office, and has served in all ranks of the operating department on railways in the West, the East and the South, operating under the most adverse conditions. He has had a large executive experience, having been general manager of the Queen & Crescent, vice-president of the Great Western, and vice-president and president of the Seaboard Air Line. He has represented railways in dealing with the public in varied ways, having been chairman of the General Managers' Association of Chicago prior to going to the Great Western.



W. A. Garrett

Recognizing fully, as he does, the fact that the old days of railroading have passed, he is also well fitted to conciliate public opinion along the line of the road by treating the public considerately and fairly; and this, in the case of the Pere Marquette, is of primary importance, because if that road is ever to be put on its feet it is prerequisite that the people of Michigan, and especially those along its lines, shall be brought to a realization of the road's necessities and to a willingness to have its necessities provided for through increased revenues.

With Mr. Garrett's great experience and energy and his desire and disposition to give the public a square deal if the people whom the road serves will meet him half-way, his going to the Pere Marquette should mark the beginning of a new era in the history of that company. It is highly improbable, however, that the most able and experienced management can put the road in good condition and give the service which the public wants and ought to have unless increases are made in the freight or passenger rates of the Pere Marquette or in both. During the last session of the Michigan legislature a committee of that body was appointed under joint resolution of the House and Senate to investigate the affairs of the road, and it made a report clearly defining the situation.

It has been charged at times that not only the stock but the bonds of the Pere Marquette have been watered. The legislative committee, however, reported that it was "satisfied that the money represented by the funded debt, approximately $70,000,000, has been paid into the Pere Marquette corporation; that all of the bonds are honest; that none of them are watered, and that the persons owning them have honest claims." The insolvency of the property, the report clearly showed, was due to increases in the cost of supplies, in wages and in taxes, unaccompanied by any increases in rates, but on the contrary accompanied by decreases in them. Both the freight and passenger traffic densities of the road are relatively small, the former being 850,000 ton miles per mile of road, and the latter 93,000 passenger miles per mile of road. A road with an average freight rate of 8 or 10 mills and an average passenger rate of 2 cents might get along very well with these densities of freight and passenger traffic, but unfortunately the Pere Marquette's average rate per ton mile is only 6 mills and its passenger rate only 1.84 cents. It is impossible under present conditions as to wages, prices of materials and equipment, and service demanded by the public for any railway with so light a traffic and such low rates to earn anything like a decent return.

This the legislative committee recognized, saying in its report "that the interstate freight rates . . . are inadequate as applied to this road, and that the state might well aid in securing a readjustment." It pointed out also that while some of the branch lines are extremely unprofitable, "yet it is imperative for the good of the state that their operations should be continued," and therefore added, "we believe that some legislation should be provided permitting the Pere Marquette to charge enough on such lines to pay what the service costs." The tone of the report indicates a disposition on the part of those in authority in Michigan to begin to give the Pere Marquette a fair chance.

Mr. Garrett was born August 18, 1861, at Canton, Miss., and began railway work in 1876 as a messenger in the ticket office of the Ohio & Mississippi Railway. Later he went with the St. Louis Union Depot Company, where he was successively office messenger, clerk in the car department, timekeeper, assistant paymaster, purchasing agent, conductor, yardmaster, secretary and assistant superintendent. From March, 1893, to January, 1896, he was superintendent of the Terminal Railroad Association of St. Louis, and also from December, 1893, to the latter date he was terminal superintendent of the Wabash, and from January, 1894, to January, 1896, was also superintendent of the St. Louis Merchants' Bridge Terminal Railway. On January 1, 1896, he was made superintendent of the Western division of the Wabash, and in April of the following year was transferred to the Middle division of the same road. He went with the Philadelphia & Reading in August, 1899, as superintendent of the Philadelphia division, was transferred to the New York division of the same road in September, 1900, and in March, 1902, was promoted to general superintendent. Mr. Garrett was general manager of the Cincinnati, New Orleans & Texas Pacific and the Alabama Great Southern from May, 1903, to November, 1906, when he was made vice-president of the Seaboard Air Line. He was elected president of the latter road in April, 1907, which office he held until October, 1909. He was then for two years vice-president of the T. H. Symington Company. From October 1, 1911, to September 18, 1912, he was chairman of the General Managers' Association of Chicago and the Association of Western Railways.

STEEL PASSENGER CARS*

BY F. M. BRINCKERHOFF

The aggregate sum involved for construction of an equipment of all-steel cars for a railroad of any considerable size amounts to many millions of dollars. It is, therefore, of the utmost importance that before designs and specifications are adopted, full consideration be given to all of the many factors which combine to make a successful and satisfactory steel passenger coach from the viewpoints of the passenger department, the transportation department, the mechanical department and the traveling public.

It is confidently expected that a steel passenger train car, properly maintained and repainted at suitable intervals, should be serviceable from thirty to forty years, or somewhat longer than the average wooden car. Assuming that the cost of power for hauling one pound of car weight per year averages one cent, and, in rapid transit service this cost is usually safely assumed as five cents, it is obvious that, before a railroad adopts a steel passenger train car design, time will be well spent for an investigation of the most searching and conscientious character, into the various methods of constructing steel passenger train cars in order to secure for service a car of minimum weight, though still possessing suitable strength and all other necessary characteristics. Twenty dollars per ton per year for thirty or forty years is a pretty heavy penalty to pay for accepting a hasty or undeveloped design involving unnecessary weight. On the other hand, saving in weight must not be made to the detriment of maintenance costs.

In designing steel passenger train cars to meet the exacting service requirements of this day of close competition between transportation systems, and of low rates per passenger mile, it is necessary that full advantage be taken of the strength and other physical properties of the materials entering into the construction of the car, in order that the finished structure may combine, to as great extent as possible, the following essential features: Safety and comfort of passengers; low cost of operation; low cost of maintenance, and moderate first cost.

Safety of Passengers.—In consideration of safety, not only should the capacity of the car body structure to resist collision and derailment shocks be regarded, but co-operation with the claim department may disclose to a trained observer many little details of finish, hardware, clearances, etc., which may have caused personal injury in the past, and which can easily be avoided in a new car design.

Except in cars of special type or cars constructed with blind ends, wherein the end sill is also the buffing sill, all the shock of collision impact will be received by the center sills through the medium of the draft gear and the buffing device. Every precaution should be taken in the design to secure the center sills against buckling in any direction, due to shock or load applied to the buffing sills, either in a longitudinal or a vertical plane. The source of the longitudinal shock is obvious, and that a vertical load on the end of the center sills occurs when cars override in collision or derailment, is equally true. A usual method followed when calculating strength of center sill construction, is to assume a given shock as divided between the buffing device and the draft gear in a definite proportion. It frequently occurs, however, that heavy shocks are delivered against a closed knuckle, in which case the loading of the center sills as assumed in such calculations is not realized, and, should the shock be sufficient, buckling of the sills will occur unless the draft gear should first fail, in which case the shock will be transferred to the buffing device; and again the load is at variance with that assumed in the calculations, and the entire sills forward of the truck may buckle in the upward direction. In order to avoid excessive weight of the deep center sill construction necessary to meet the above described eccentric loading, it is advisable to support and align the center sills against deflection by means of suitable cross-bearers and body end sills attached to the side frames and center sills. In this manner the center sills will be relieved of all deflection due to live or dead load, and their full section will be available to transmit the longitudinal shock.

The calculation for strength of the center sill to resist end shock should be supplemented by an investigation of its ability to support the car when, for example, the buffing sill of one car overrides the buffing sill of another car in collision and the truck has been derailed, leaving the center sills unsupported at the center plate.

Permissible Weight.—The permissible weight will vary, of course, for each type of car, and will be governed by character of service, local conditions, including average number of cars in trains, grades encountered, frequency of station stops, schedule speeds required, and other details all worthy of careful study. Generally speaking, a consistently designed steel coach should weigh less than a wooden coach of the same dimensions, and will be materially stronger. While a steel coach can be designed to be of much less weight than a wooden coach of similar dimensions and still have ample strength, its adoption would seem, for economic reasons, to be warranted only under special operating conditions. There should be no compromising with safety when designing a steel passenger train car, and yet each member entering into the structure must be consistently and constantly studied to determine its permissible weight, and to secure the full development of its strength through its connections with associated members. The same close scrutiny must be given to all specialties and trimming entering into the complete car, in order that unnecessary weight be not incorporated.

Weight of Car per Seated Passenger.—This feature, associated as it is with seat spacing and saloon arrangement, must be determined after careful study of the service in which the cars are to be used. By a careful selection of the seat with full consideration of depth, angle, width and height of back and of the covering material, it may be found that a satisfactory distance between seats can be adopted that will materially increase the seating capacity of the car without notable increase of body length and weight. The increased seating capacity thus secured may be equivalent to that of one car in an eight or ten car train, resulting in a considerable saving in weight of train per 1,000 passengers, as well as in length of train as affecting, or being limited by, terminal facilities.

Type of Framing.—In circular No. 2, issued by the post office department, covering the construction of steel postal cars, it is specified that, in calculating the strength to resist buffing shock, only underframe members below the floor line shall be considered, but that these underframe members may be considered as supported against buckling vertically by the superstructure between center plates, at cross-bearers, to the extent that the strength of superstructure, cross-bearers and attachments is available for this purpose.

This is a clear indorsement of the method of steel car design in which advantage is taken of the side frame of the car to support and align the center sills, by the introduction of frequent cross-bearers, and thus, by virtually dividing the length of the center sill into a series of short columns, be enabled to use much lighter center sill construction than would be necessary if the center sills had to be self-supporting between bolsters, and act in compression without the co-operation of the side frame.

It is, of course, essential that ample section be used in the center sill construction to withstand the expected strains, but by the use of adequate cross-bearers, well connected to sills and side frames, it will be found possible to design suitable center sills of practically uniform section for their entire length and thus effect a great economy in weight, as compared with fish-belly center sills frequently used in passenger car construction. Full attention must be given to the strength of body end sill and the draft sills in order to secure the center sill structure forward of the bolsters against destructive strains from collision impact shocks. The body end sill, with its cover plates and connections, should be designed to transfer all vertical loads

*Abstract of a paper presented at the February meeting of the New England Railroad Club.

from the center sill to the side frames, supporting and aligning the center sill against deflection in any direction.

Aside from the feature of reduction in weight that will be secured by the use of properly supported center sills of uniform depth, as outlined above, the unobstructed underframe is particularly desirable for the application and inspection of equipment. The rigidity of an all-steel car underframe makes the use of an adequate draft gear practically imperative, and the installation of an effective buffing device will be of great operative value. The importance of these two features increases as the car weight and train speeds increase, but they should be included even in the lightest steel cars.

When studying the side-frame construction, consideration should be given to the possibility of utilizing the entire side of the car as a truss or girder with the side plate as top member, instead of using the belt rail as the top member of the girder formed by the side below the windows. The former method gives a truss construction of about 7 ft. in height, instead of a girder of about 3 ft., as by the latter method. The necessary width of posts for the truss can be secured by alternate wide and narrow piers between windows, and the saving of weight for equivalent strength will be notable. This method of side construction, utilizing the entire side of the car as a truss, was never possible in wooden passenger train car construction on account of the window openings. In steel, however, it is entirely practical to so proportion and reinforce the window piers that a very effective truss construction can be obtained.

Vestibule Construction.—The use of wide vestibule construction for steel passenger cars, can, by consistent association of its members, be made to serve as a very effective defense of the car body proper when subjected to severe collision impacts. The relative strength of the car-body structure and of the vestibule should be such that the vestibule will fail first and thus, in collapsing, the wrecking of its members will, to a considerable extent, absorb the impact shock. For obvious reasons, the vestibule frame members should be so connected to the car-body frame as to permit the removal and repair of a damaged vestibule without disturbing the body of the car.

Roof.—A carefully designed roof can greatly add to the ultimate shock resistance of the car structure. The side decks virtually acting as flanges for the tops of the side frame, will preserve its alinement and prevent spreading of the side plates and posts. This function of the side deck, with its deck sill, should not be overlooked in any case, but will be of most importance when considerable compression is taken by the side plate. The roof construction can also be made to afford a considerable element of safety on occasions when the car may have been derailed on an embankment or bridge and overturned.

Elimination of Joints.—One of the greatest destroying agents of any steel structure is corrosion. Consequently, such joints between the members as may possibly admit of retaining moisture are particularly to be guarded against. Probably the most vulnerable joint and the one occurring most frequently is the junction between post and sash rest. This joint is complicated by the presence of the movable sash and, as a possible lodgment point for dirt and moisture, must be designed with the view of being as self-cleaning as possible. This same danger exists at deck sash, and all other points where abrupt changes of surface outline may form pockets.

Sharp edges of steel members are also difficult to protect against corrosion as they can never be satisfactorily painted, and in cleaning the car such paint as was originally applied is soon worn off. When possible to design the structural parts in such form as to eliminate overlapping joints, a direct saving of weight may be accomplished.

Clasp Brakes.—In a recent test of a modern air brake equipment on cars fitted with clasp brakes, two shoes per wheel on all eight wheels, stops were made from speeds of 55 miles per hour in 16 seconds, during which the cars proceeded 720 ft. The cars tested are 72 ft. in length overall, and weigh, complete with motive power, 119,500 lb. each. As the electro-pneumatic brake equipment employed provides for the simultaneous application of the brakes on every car of the train, regardless of the train length, the above rate of braking would permit of bringing a train of ten such cars from a speed of 55 miles per hour to a standstill while traversing a distance equal to its own length. The tests referred to were protracted to the extent of making 258 test stops from speeds ranging from 30 miles per hour to 57 miles per hour. The total distance traveled during the tests was 270 miles. The total brake shoe pressure per car in emergency stops was 174 per cent. of weight on wheels. No wheel sliding occurred, and the emergency stops, while abrupt, did not disturb the standing observers, there being practically no reaction. Brake leverage ratio was 9 to 1.

The purpose of the test was to determine the relative retardation efficiency of simple brakes and of clasp brakes for high speed service. It was found that about 18 per cent. was gained in time of stop, and about the same in distance, by the use of clasp brakes instead of simple brakes. The two tests were absolutely identical as far as the brake rigging was concerned; the only change made was, that in the clasp brake tests we used two shoes per wheel and in the simple brake tests we used one shoe per wheel. Total shoe pressure per wheel was the same in both cases.

Aside from the improved stopping capacity secured by the use of clasp brakes, there is a notable increase in mileage per shoe, realized on account of the more efficient working temperature of the clasp shoe system, with its lower pressure per square inch of working surface. This saving appears in regular service, aggregating about two million car miles, to amount to approximately 18 per cent. An incidental and very important result of the use of clasp brakes is the minimizing of hot journal troubles by their use. This is obviously due to the fact that during braking the two shoes press with equal force on opposite sides of the same wheel. This same clasping action of the brake shoes relieves the journal boxes and pedestal guides of considerable of the strain and wear incident to the simple brake, and as there is no binding of the journal boxes in the guides when braking occurs, the riding quality of the truck is not affected at such times.

Conclusions.—In conclusion a few desirable preliminaries to the preparation of an economical design of steel passenger train cars are:

1. That all department heads and the executive officers of the road co-operate in analyzing the features they desire incorporated in the design, giving due consideration to the economic value of such features as traffic winning, labor saving, or weight eliminating.

2. That "standards," even to the length of the car body as affecting the weight of car per seated passenger, be thoroughly investigated as to their economic value, otherwise the desired reduction in weight may not be realized. The use of steel in car construction often warrants a change in standards.

3. That the matter of safety of passengers be made the subject of special research into the known behavior of steel passenger train cars when subjected to stress of derailment and collision.

4. That the weight, operating cost and maintenance cost of the various types of steel passenger train cars now in service be investigated, to determine their relative economic value for railroad service.

5. That in any new truck design, provision be made for the application of the best and most efficient form of clasp brake rigging.

The present state of the art of steel passenger train car construction, though very promising, does not warrant the setting aside of all existing wooden cars and the substitution of all steel equipment. The enormous expense involved by such action will be only warranted after careful investigation of the operating characteristics of steel cars now in service, and further development of designs to meet the shortcomings as disclosed by such investigations.

The Chicago, Milwaukee & St. Paul Accounting Case

The Interstate Commission Gives Out Its First Drastic Opinion on Violations of Its Rules of Accounting

The following is the opinion in full of Commissioner Harlan in the investigation by the Interstate Commerce Commission in the matter of rates, practices, accounts, and revenues of carriers subject to the act to regulate commerce:

The purpose of this proceeding is sufficiently indicated by its general title. It was instituted as a basis for the formal investigation, from time to time as circumstances might require, of the failure of carriers subject to our jurisdiction to follow and obey our accounting classifications and otherwise to comply with the accounting rules and regulations heretofore prescribed by the commission for interstate carriers. The accounting practices of the Chicago, Milwaukee & St. Paul Railway Company and of the Chicago, Milwaukee & Puget Sound Railway Company are the first to come under our observation since the inquiry was instituted.

Before stating the facts respecting the accounts of these two companies, as developed upon the record, it seems proper briefly to review the circumstances that led the Congress to delegate to this commission authority to deal with the accounting practices of interstate carriers and to explain the successive steps in the development of that authority as it is now embraced in section 20 of the act.

As originally enacted the act to regulate commerce required interstate carriers to file annual reports with the commission covering specifically defined items. It also provided that the commission, in its discretion, might prescribe a uniform system of accounts for carriers subject to its jurisdiction. But the act contained no provision for the enforcement of the orders of the commission in such matters. This defect was remedied by the amendments of 1906, which not only prescribed penalties for the violation of the rules and regulations of the commission but established a process by mandamus for enforcing our orders. It also provided for a force of examiners having authority to inspect the accounts, records and memoranda of carriers. This gave to section 20 a vitality that was theretofore lacking and put the commission in a position effectively to administer the law respecting the accounts of interstate carriers.

Beginning with the year 1888 the steam railroads were required to render annual statistical reports of their operations on blanks provided for the purpose by the commission. So far as mere form was concerned these reports were therefore uniform. They did not inspire public confidence, however, because the commission, as just stated, was then without effective authority for the enforcement of any accounting rules had such rules been promulgated. It is true that classifications of operating expenses were issued in 1888 and reissued in revised form in 1892. There was also a classification of expenditures for construction. But those classifications were not issued under order, and all the commission could do to secure their observance was to request the carriers to comply with them in order, so far as possible, to secure uniformity in their reports to the commission.

Immediately after these defects in the act were corrected by the Hepburn amendments of 1906, the commission entered actively upon the work of formulating a system of accounts for steam railroads. The co-operation of the railroads through their association of accounting officers was enlisted, and the result was that three important classifications were issued under an order of the commission on June 3, 1907, to become effective on July 1 following. These were the classification of operating expenses, the classification of operating revenues, and the classification of road and equipment expenditures.

It is not our purpose here to discuss the principles underlying these classifications. It will suffice to say that one of the points in greatest need of regulation from an economic point of view, as disclosed by the previous delinquencies in the accounting of railroad companies, was the drawing of a correct line between expenditures for property and expenditures for operation. The need of such a distinction in railroad accounts is elementary; nevertheless, all students of railroad economics are well aware of the fact that, prior to 1907, when the commission was given real power to control such matters, the accounts of carriers in many cases were influenced more by other considerations than by a desire to reflect the actual facts. A financially strong road making large net earnings would not hesitate to conceal the facts by adding to its operating expense accounts sums disbursed in improving its property; on the other hand, a financially weak road, seeking to enhance its credit by a good showing of operating results, would include in its property accounts sums expended in operation. The result was that a carrier's annual and monthly statements of net revenue often reflected nothing more than the particular showing desired by its executive. These reports were often used for speculative purposes, and the stockholder and the general public were left without any assurance as to whether the dividends declared were paid from income or surplus or out of capital.

A correct statement of the property account of a carrier is of scarcely less importance than a correct statement of its expenditures for operation. It is our understanding that prior to 1907, when the commission had no efficient control over such matters, the accounts representing the cost of road of many steam railway companies had substantially no real significance, except as they demonstrated the utter disregard of all accounting principles. As a rule they represented neither investments nor assets. Although described as "cost of road and equipment," they frequently bore no relation whatever to cost. They often included, at par value, large amounts of stock issued as premiums to promoters and investors in bonds or held in the treasury of the issuing company, in the hope that the future growth of the company's traffic, or the exigencies of corporate control, might give them some value. But in promulgating its classification of expenditures for road and equipment in 1907, at which time the commission was first given effective authority to prescribe a system of accounts and to enforce its observance, the fundamental rule laid down by the commission was that all entries in the accounts of a carrier under that head should be in terms of cash only, thus showing what it cost to create the property at 100 cents on the dollar. The general basis for the rule was that a correct statement of the investment is the beginning of correct accounting; and this sound principle gives us a balance-sheet statement of cost that is a record of the actual investment.

Recognizing the value of the accounting rules promulgated by the commission, as well as the benefit of some supervision over their accounts through official agencies, practically all the carriers subject to the act have yielded a cheerful acquiescence in our classifications and regulations and have adjusted their accounts in substantial obedience to their requirements. The spirit of co-operation with us in this work and a recognition by the carriers of the true functions of proper accounting are becoming increasingly manifest. This general statement, however, involves some exceptions. There have come to the knowledge of the commission several instances of serious departures from our accounting regulations, some of which are so important as to require our attention in this proceeding. The first of these instances since this inquiry was instituted arose upon our examination of the accounts of the Chicago, Milwaukee & St. Paul Railway Company, and of its subsidiary, the Chicago, Milwaukee & Puget Sound Railway Company, hereinafter respectively referred to for convenience as the St. Paul company and the Puget Sound company.

In 1905 the St. Paul company commenced the construction

of a line to the Pacific coast, extending from a point in South Dakota on the Missouri river to Seattle, a distance of 1,400 miles. It intersects the Northern Pacific at a number of points and traverses much of the territory occupied by that line. By availing itself of the services of the Northern Pacific for the transportation of materials, the St. Paul company was therefore enabled to carry on the construction of the new line from several different points at the same time, thus greatly facilitating and expediting the work. Portions of the new line were in operation and commercial traffic was moving over them in substantial volume early in the year 1908. The entire main line was opened for traffic on August 1, 1909. During the period of construction and between the years 1906 and 1909, inclusive, the St. Paul company transported men and materials for the construction of the new line. It also advanced the funds for construction, amounting on January 1, 1909, to about $82,000,000. Under the accounting rules of the commission the St. Paul company was permitted to include in its accounts a proper revenue for such transportation, rents for equipment and other of its facilities used in the construction of the Puget Sound, and interest on the funds advanced. This should have been done from month to month and from year to year as the service was performed and the funds so made available to the Puget Sound company. That course, however, was not pursued. On the contrary, the St. Paul company included in its income accounts for the year 1910, all the interest, rents and revenues assignable to the period prior to July 1, 1909, the sum total amounting to over $4,600,000. In the same year it also decreased its operating expense accounts by crediting thereto more than $500,000 on account of salvage from cars destroyed previous to the year 1907. By means of these entries the income of the Chicago, Milwaukee & St. Paul Railroad Company for the year 1910 was overstated by more than $5,000,000.

As the result of this overstatement of income for the fiscal year ending June 30, 1910, the report of the St. Paul company for the succeeding year showed an apparent falling off in revenue and income as compared with the previous year of over $2,000,000. In its report to its stockholders for the latter year the explanation offered by the officers of the company was that—

the large decrease in the net operating revenue is accounted for by the inability to obtain increased rates and the great increase in the cost of labor.

This statement was not in accordance with the facts in the case. Had the income for the year 1910 been properly reported the net income for the following year instead of showing a decrease would have shown an increase of about $2,800,000 over the net income for the fiscal year ending June 30, 1910. The reference to "the great increase in the cost of labor" was no less at variance with the real facts. In its report to this commission for the year ending June 30, 1910, the St. Paul company, under the heading "employees and salaries," shows the following tables:

Number of employees June 30, 1910, excluding general officers	56,658
Total yearly compensation	$30,998,418.73
Average daily compensation	$2.23

The report for the fiscal year ending June 30, 1911, gives the corresponding statistics for that year, as follows:

Number of employees June 30, 1911, excluding general officers	48,083
Total yearly compensation	$30,942,724.10
Average daily compensation	$2.27

So far, then, from being an increase in the expenditures for labor during the fiscal year 1911, the expenditures on that account were about $50,000 less than in the previous year, according to the company's own reports to the commission.

These departures from what were the actual facts are sufficiently serious to merit the strongest condemnation. The delinquencies in the accounting of the Puget Sound company are, however, of even greater significance. The construction of this line was generally regarded as a notable project and its progress attracted wide attention. The outcome of the enterprise, in respect of the financial returns to the parent company from its operations, was also a matter of both general and special interest, for a showing of profit from its operations could not fail to enhance the credit of the parent company. A large traffic was offered to the Puget Sound line as soon as it was opened, and the evidence before us leads us to think that a correct showing of the operating results for the first year would have been most satisfactory. Not content, however, with a statement of the facts, the income of the Puget Sound was greatly overstated, a variety of expedients having been resorted to for this purpose:

As we have heretofore indicated, the Puget Sound line was opened for regular commercial traffic on August 1, 1909. Its first annual statistical report was filed with the commission for the eleven months ending June 30, 1910. During that period the road moved a large revenue traffic and at the same time was engaged in completing the construction, more particularly, of its branch lines. In consequence of this condition of affairs expenditures for construction were made while expenditures for operation were also going on. In accounting for these two classes of expenditures for entirely different purposes, large amounts were included in the cost of construction that should have been entered up as expenses of operation. This course resulted in an inflation of the property account and at the same time made an unwarrantably good showing of the returns from operation. The net income was also overstated by including in the cost of construction certain interest items accruing after August 1, 1909, when the road was opened for public service. Under our rules and regulations this interest should have been charged to income; and this departure from our regulations alone involved nearly $500,000 of error in the report of the Puget Sound company for that year. Moreover, revenues were overstated by including charges for the transportation of construction material at rates substantially higher than those exacted under its published tariffs by the Northern Pacific. This was done notwithstanding the recognized practice of carriers to use rates on such materials which represent only the actual cost of the service. The result of this course was to augment both the revenues and the cost of property accounts. While overstating those accounts the Puget Sound company on the other hand included in its operating expenses no charges whatever for depreciation of its equipment. Had these different items been carried to its books in accordance with the rules and regulations of the commission and in conformity with correct accounting practices the income for the Puget Sound company for that year, reported at $2,255,440.18, would have been practically eliminated. Its dividend of 2 per cent. paid out of "income" for the first year of its operation could not have been paid; and without this income the St. Paul company, which was practically the sole holder of the stock of the Puget Sound company, would not have been able to pay its own dividends for the year 1911 out of its income. In order to have made the payment in full it would have been compelled to resort to its surplus from previous years.

The unlawful practices just described were continued after June 30, 1910, and the fictitious showing of income for that period was used by the officers of the Puget Sound company to aid in the sale of its bonds. A letter written by the chairman of its board of directors and published in the *Commercial and Financial Chronicle* of March 18, 1911, contains this statement:

Although the Chicago, Milwaukee & Puget Sound Railway was opened for traffic only on August 1, 1909, it is already earning a large surplus over the interest on its first mortgage bonds. For the six months ended December 31, 1910, the surplus income of that company after the payment of all charges, including interest on the $123,000,000 first mortgage bonds, amounted to $1,635,952.

It should be stated that only $27,175,000 of these bonds have been sold to the public, the remainder being held in the treasury of the St. Paul company.

Another violation of proper accounting and of the commission's accounting regulations by the Puget Sound company has

occurred in its report of property investment. As heretofore explained, the underlying principle of the classification of expenditures for road and equipment is that the entries in those accounts shall be stated in cash values. In its first report to the commission the Puget Sound company reported its investment in road and equipment at $236,333,988, and this amount was carried into our official statistics of railways for the year 1910. Our subsequent investigations of the accounts of this carrier show, as it now admits, that the statement was about $100,000,000 in excess of the cash investment of the company at that date. Its officials attempt to explain this by saying that the laws of the state of Washington forbade the company to issue bonds without first issuing capital stock to an equal amount. They assert that there never was any pretense that the stock so issued represented a cash investment and that it was never disposed of but was retained in the treasury of the company with no intention at any time of offering it to the public. We have not examined the laws of that state to ascertain how far they may explain the situation. But the course pursued was in violation of the commission's rules and, to the extent of $100,000,000, falsified the statistical report for that year officially issued by the commission. In the grand total of the report that sum may make only a small percentage of error. This, however, does not excuse the Puget Sound company for the misstatement of its investment. Even if the laws of the state of Washington compelled it to issue a large amount of stock representing no investment in order to legalize its issue of bonds, there was no necessity for including the par value of that stock in its property investment account. In fact the fundamental rule, to which we have alluded above, specifically excludes from the investment account items which do not represent investments in terms of cash. Except for the error thus unlawfully injected into our statistics this violation of our accounting regulations is now of no great importance because the St. Paul company has recently absorbed the Puget Sound company by merging the whole property under the one company.

Since the hearing we have been advised of another matter which may appropriately be mentioned here, namely, that the St. Paul company, having first established a percentage of depreciation of equipment of one and one-half per cent. a year, began on January 1, 1913, to set up a charge of only one per cent. This means, omitting the item of salvage, that its equipment has an estimated life approximating 100 years, a position that is wholly indefensible as we understand these matters and one which that company will not be able in any event to justify. The investment in equipment by the two companies, now merged into the St. Paul company, approximates $100,000,000. A reduction of one-half of 1 per cent. in its charge for depreciation, therefore, means that its net income from operation is inflated by a half million dollars a year. If the charge ought properly to be three per cent. the entry on its books of only one per cent. would mean an inflation of its net income from operation by $2,000,000 a year. The St. Paul, however, does not stand alone in this disregard of correct accounting principles. Moreover, the matter of depreciation is having attention in another connection, and the course of the St. Paul company in that regard need not be further considered here.

The other violations of the commission's accounting rules and regulations hereinbefore described are explained by the St. Paul company as having resulted from negligence, inattention, and a lack of familiarity on the part of its comptroller and those under him with the requirements of the commission. It is said that the comptroller, now deceased, was accustomed to the older methods of accounting and had not yet put himself fully in touch with the methods prescribed by the commission and that for this reason the accounts of these carriers, in the details mentioned, were not in harmony with the commission's regulations. There is no sufficient basis of record, however, to enable us to condemn or acquit the comptroller either of full responsibility or of his share of responsibility for the condition of the accounts of these companies here described; but there are grounds for thinking that his responsibility was very materially qualified and minimized by the instructions and directions given him by the executive and other officials. Whatever may be the fact in that regard the commission now feels that the present accounting officers of the St. Paul company are fully advised of the commission's requirements, and a more careful observance of our rules and regulations is promised for the future. This we confidently anticipate will be realized. Nevertheless we feel it our duty to make this record of what has transpired in the past. We do not mean to be understood by anything here said as intimating that the St. Paul company is not a valuable property and is not achieving the results reasonably anticipated from the extension of its line to the Pacific coast. The last report of the Puget Sound company to this commission as a separate property covered the period July to December, inclusive, of the year 1912. The earnings for that period, as compared with the earnings of the corresponding periods of previous years, show a very substantial growth. After making all due allowance for undetermined misstatements in the reports, the showing of results of the operation of the new line must be regarded as very favorable. What we wish to make clear is that the accounts of these companies have not correctly shown the facts, a condition of affairs not creditable to the St. Paul lines or to their officials.

It is desirable also to take this occasion to make some announcement with respect to our own future course in cases of accounting delinquencies of this nature. As has already been said, the principal classifications in our system of accounts for steam railroads were formally announced on June 3, 1907, and became effective on July 1 of that year. It was not a new system, embodying principles of railroad accounting originating with the commission or which were unfamiliar to railroad men; on the contrary, the system was put in effect by the commission only as the result of prolonged conferences with the accountants of the carriers. We availed ourselves of the best thought of these experts and of the best practices then in effect among the carriers of the country. While the system finally prescribed does not conform exactly to the accounting practices theretofore observed by any particular railroad, it represents the consensus of opinion among the accounting officers of the country as to what system would best and most accurately reflect the true facts and accord with sound business principles. We have regarded the interval since the promulgation of the earlier and more important classifications as a formative period and have patiently considered and disposed of the questions that have arisen under them. The underlying principles of the system have been maintained and have fully justified themselves. Their application to particular states of fact have from time to time been the occasion of doubt, correspondence, and final disposition; in this work of perfecting the system and making precedents for the application of its principles we have had, generally speaking, the cordial co-operation of the accounting officers of the carriers. The result of this experience is about to be expressed in a revision of the classifications. These, however, will embody no important modifications of the general principles underlying the commission's rules.

It should also be said that during this formative period we have not invoked the penalties of the law against carriers and their officials for errors and failures to observe our rules and regulations. As these matters have come to light they have been corrected, after being called to the attention of the carriers involved. One or two vital principles in the accounts have been the subject of litigation in the courts. The water lines denied our jurisdiction over their port-to-port transactions. On that point the views of the commission were sustained in *Interstate Commerce Commission v. Goodrich Transit Company.*, 224 U. S., 194. The rules governing the treatment of property abandonments were also contested, and the commission was sustained in that respect in *Kansas City Southern Railway Company v. United States,* 231 U. S., 423. With respect to all other infractions of our rules and regulations that have come to our attention satisfactory conclusions have resulted from our confer-

ences and correspondence with the delinquent carriers, or they are in process of adjustment. In the case now under consideration the accounts of the St. Paul company are being recast to bring them into harmony with our rules and regulations so far as that is now possible.

It is, perhaps, unnecessary to emphasize the necessity and importance of statistical reports from carriers that will be uniform and truly reflect their condition so far as it may be represented in their accounts. Recent years have witnessed the exposure of glaring instances of the financial wrecking of transportation agencies by those in positions of authority. In many of these instances the application of correct accounting rules and principles, with proper knowledge on the part of the public and of all the stockholders of the conditions thus reflected, would have gone far to avoid such consequences. Moreover, the general public interest demands that the financial reports of carriers shall be true records of the facts that they purport to show. Public confidence both at home and abroad in the financial statements rendered by our carriers is very necessary to the further development of our transportation facilities; and to the degree that the accounts of any carrier are tainted with the suspicion of untrustworthiness, to that extent they will tend to impair this confidence among investors in the securities of our transportation companies and thus work to the detriment of all such enterprises.

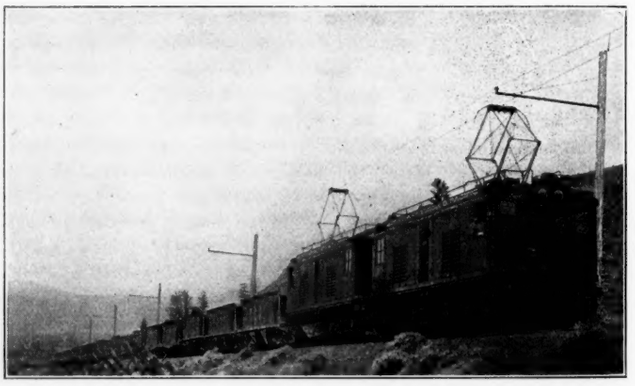
But in order that an erroneous impression may not obtain as to the commission's relation to such matters it should be understood that the law places upon the carriers the full responsibility for the correct statement of their accounts in accordance with the prescribed rules and regulations. The responsibility does not rest upon the commission, and the burden of such a requirement would be sufficient to demonstrate the impracticability of any such plan. It is well to add that the present statements of the assets and liabilities of carriers are still largely affected by the records and accounts of the period prior to the legislation giving authority to the commission over the accounts of carriers. Moreover, it is important to observe, with reference to the current accounts of the carriers, that our force of examiners is relatively so small as to make it impossible at regular intervals to inspect the accounts of the railroads and other instrumentalities of interstate commerce, and thus to give assurance that the results of their operations, their income, their assets, and their liabilities will be correctly shown on their books. We are thus compelled to rely in large measure upon the co-operation of those in charge of the accounts of carriers in reaching these results.

The formative period to which we have referred must now be considered as having come to an end so far as all the important principles and requirements of our regulations are concerned, and we shall hereafter expect a more exact observance of the prescribed accounting systems by the carriers and their officials. Accounting officers understand the true functions of accounts and realize their importance in determining the correct economic condition of the transportation properties with which they are affiliated. Their instincts and training are such as naturally to lead them to keep their accounts as they should be kept. They would not have the confidence of their superior officers if this were not the case. But in many instances the accounting officers of carriers have not been left free to follow their natural inclinations in this regard. Irrespective, however, of the influences brought to bear upon an accounting officer to turn him from his true course as an accountant and from his duty, under the law, of keeping the accounts in accordance with the system prescribed by the commission, it is nevertheless his hand, or the hand of some one immediately under his authority, that makes the wrongful record, and it is the accountant, therefore, to whom the commission must look in the first instance for the proper carrying out of its rules and regulations. Under our regulations and prescribed form the oath of the accounting officer must be attached to the annual report of the carrier to the commission, together with that of the executive; and, from the necessities of the case, it is the accounting officer who is immediately responsible and whom the commission will first hold responsible when it becomes necessary to invoke the penalties of law; but we shall not hesitate to call to account with even greater severity anyone above the accounting officer in authority who may share in the responsibility for any violations of the accounting rules and regulations which have been prescribed for the use of the carriers that are subject to the act.

ELECTRIFICATION OF THE BUTTE, ANACONDA & PACIFIC

The Butte, Anaconda & Pacific is credited with being the first steam road operating both freight and passenger service to electrify its lines purely for reasons of economy. The special factors, such as terminal and tunnel operation or rapid suburban service, which have been the determining factors in a number of steam railway electrifications, were not present in this case. This is also the first line to use 2,400 volts direct current in the trolley. The first electric locomotives were put in service May 28, 1913, hauling ore cars between the East Anaconda yards and the smelter. During the first seven months, they made approximately 201,000 miles and hauled about 2,365,000 tons of ore.

The steam locomotive crews easily acquired proficiency in handling the electric locomotives; in fact, two or three days' instruction from a competent electrical man was ordinarily sufficient. The change from steam to electricity was made without any change in the personnel of the train crews and without any delays or alterations in the schedule. The engineers, without exception, have expressed themselves as pleased with the easy



Double Unit Freight Locomotive Hauling an Ore Train

operation of the locomotives. The locomotives have been maintained by the regular shop force with the assistance of one man experienced in electrical apparatus.

The Butte, Anaconda & Pacific is essentially an ore hauling road, the freight traffic from this source originating at the copper mines located near the top of Butte Hill. From the mines, the ore trains are lowered down the mountain a distance of 4½ miles to the Rocker yards located a few miles west of the city of Butte. At this point, new main line trains are made up for transportation to the smelters at Anaconda. The main line division extends through a rough mountainous country, a distance of about 20 miles.

At East Anaconda, the main line trains are broken up and hauled up Smelter hill to the stock bins, where each car is run over the scales and weighed. The eastbound traffic consists in returning empty cars to the mines and the transportation of copper ingot to the Butte yards, where it is shipped over other roads to refineries. The electrified lines extend from the Butte Hill yard to the smelter, a distance of 32 miles. There are numerous sidings, yards and smelter tracks that have been equipped with overhead trolley, making a total of about 95 miles of single track.

Between the cities of Butte and Anaconda, which are located

at the ends of the electrified portion of the system, there is considerable local traffic, both passenger and freight. The city of Butte and vicinity has a population of about 65,000, and Anaconda about 10,000. At Butte, the Butte, Anaconda & Pacific connects with the Great Northern, the Northern Pacific and the Chicago, Milwaukee & St. Paul; and at Silver Bow, about six miles from the city, connection is made with the Oregon Short Line.

The maximum curve on the system is 20 deg., which occurs on the Butte Hill line. The locomotives are designed with sufficient flexibility to take a curve of 31 deg. at slow speed.

The freight traffic consists largely of copper ore and amounts to more than 5,000,000 tons per year. This material is handled in steel ore cars weighing about 18 tons and having a capacity of 50 tons each. Trains of 30 loaded cars weighing 2,000 tons are made up at the Butte Hill yards and hauled by two-unit locomotives to the Rocker yards, where 4,000-ton trains are made up for the main line. At the East Anaconda yards, the trains are again broken up and 1,400-ton trains are sent up Smelter Hill to the ore bins. All of the shifting and spotting of cars, at the smelters and in the sorting yards, is done by single locomotive units. The customary train makeup for both east and westbound traffic is shown in the accompanying table.

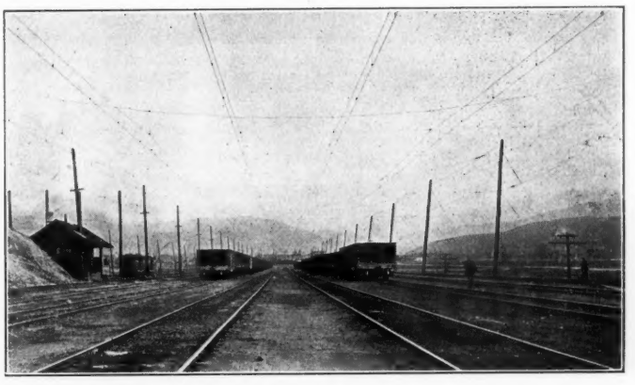
CONDENSED INFORMATION OF FREIGHT MOVEMENT

	Westbound			Eastbound		
	Butte Hill Line	Main Line	Smelter Hill	Smelter Hill	Main Line	Butte Hill Line
Trailing load in tons	2,000	4,000	1,400	1,000	1,260	650
Number of cars	30	60	20	55	70	35
Number of 80-ton locomotives per train	2	2	2	2	2	2
Approx. grade against load, per cent.	2.5	0.3	1.1	1.1	1	2.5
Approx. speed on level tangent track, m. p. h.	...	21	...	...	25	...
Approx. speed on max. grade	12	16	16	20	16	16
Average trolley voltage	2,200	2,200	2,200	2,200	2,200	2,200
Length of run in miles	4.6	20.1	7	7	20.1	4.6

Four passenger trains each way per day are operated between Butte and Anaconda. Single locomotives are used, hauling trains of from three to five passenger and baggage cars.

The energy for the operation of the electric trains is purchased from the Great Falls Power Company, Great Falls, Mont. The power is stepped up to 102,000 volts for transmission to the transformer substation at Butte, a distance of 130 miles, over two separate parallel lines constructed on the same right-of-way. An extension of the system transmits power at 60,000 volts to a second transformer station at Anaconda, 26 miles farther on. The two existing substations at Butte and Anaconda were used to house the 2,400-volt motor-generator sets required for operating the electric trains, so that no additional buildings were constructed for this purpose. Power is furnished by two 1,000-kw., 3-unit motor-generator sets in each substation, taking power from the 2,400-volt a. c. buses. These units operate continuously 24 hours per day, seven days of the week, to supply the necessary current for train operation. Each set consists of a 3-phase, 60 cycle, 1,450-kv.a., 720 r. p. m., synchronous motor direct connected to two 500 kw., 1,200-volt generators, insulated to operate in series for 2,400 volts. The generators are compound wound and have both commutating poles and compensating pole face windings. They will carry three times the normal load for periods of five minutes, as well as the usual 50 per cent. overload for two hours.

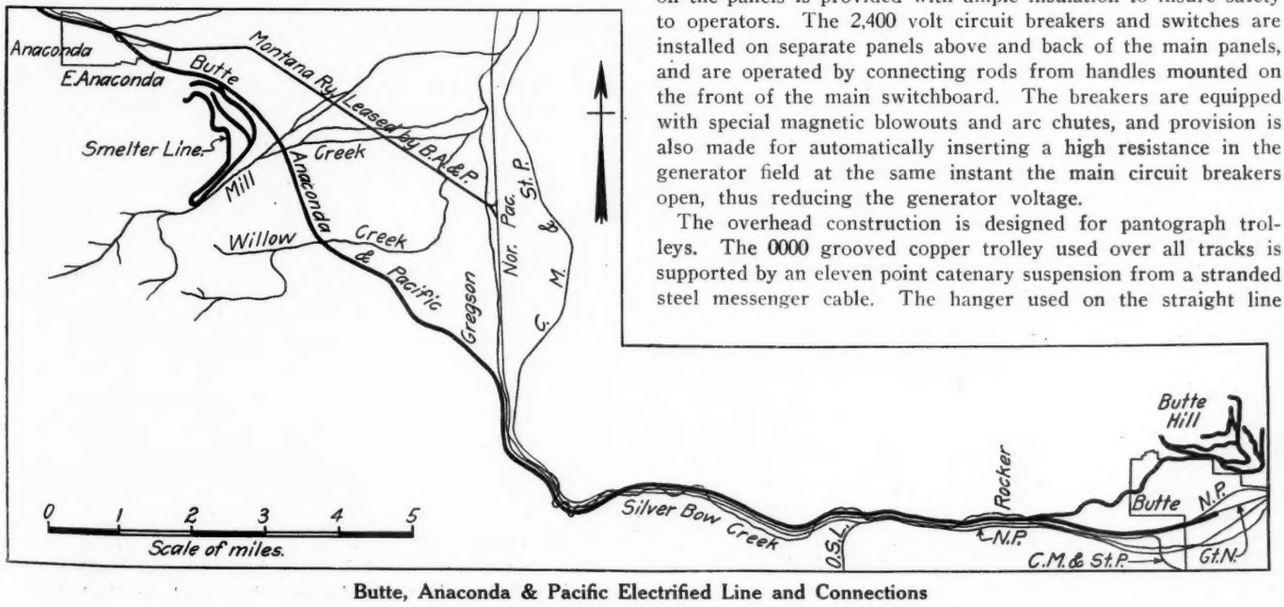
An automatic voltage regulator is used to maintain an approximately constant voltage at the terminals of the motor by power factor regulation. The motors are protected against overload by inverse time limit relays, which are set to open at four times the normal load. These relays have been adjusted to open under a sustained overload in about two seconds and upon short circuit their action is practically instantaneous. Excitation for the two generating units in each substation is obtained from two induction motor driven sets, rated at 50 kw. each at 125 volts.



A Typical Yard Showing the Overhead Construction

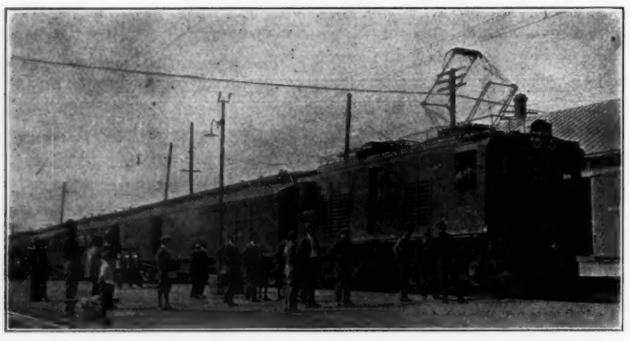
The 2,400-volt switchboards for controlling these sets are the first direct current switchboards to be constructed for this high voltage. They are similar to the standard 600 volt types, but have increased the insulation and special provisions for interrupting the 2,400 volt current. The circuit breakers and switches are arranged for remote control, and all the apparatus on the panels is provided with ample insulation to insure safety to operators. The 2,400 volt circuit breakers and switches are installed on separate panels above and back of the main panels, and are operated by connecting rods from handles mounted on the front of the main switchboard. The breakers are equipped with special magnetic blowouts and arc chutes, and provision is also made for automatically inserting a high resistance in the generator field at the same instant the main circuit breakers open, thus reducing the generator voltage.

The overhead construction is designed for pantograph trolleys. The 0000 grooved copper trolley used over all tracks is supported by an eleven point catenary suspension from a stranded steel messenger cable. The hanger used on the straight line



Butte, Anaconda & Pacific Electrified Line and Connections

construction is a rolled steel strap looped over the messenger wire. The section breakers were designed for the 2,400 volt service, and at six points insulated crossings are necessary at the intersection of the 2,400 volt trolley with the 600 volt trolley of the city system. On the main line a very simple section insulator is used. This consists of paralleling the two trolley wires from the ends of each section at a suitable distance for insulation so that the pantograph bridges the two circuits for a short distance, thus avoiding interruption



An Electric Passenger Locomotive and Train

of the power supply to the locomotive. The construction in the yards and sidings is simplified by paralleling the trolley from the side tracks for a short distance along the main line. This avoids the use of switch plates or similar devices. At some of these junction points the pantograph engages as many as six trolley wires at the same time.

The trolley wire is reinforced between the substations with two 500,000 c. m. bare copper cables tapped to the trolley at intervals of 1,000 ft. A 0000 negative return wire is also installed between Rocker and East Anaconda. This wire is carried on the trolley poles and is connected to the cross bonds at intervals of 1,000 ft. The substations are normally connected together by these feeders, allowing an interchange of current. In emergency either station can supply current to the entire system.

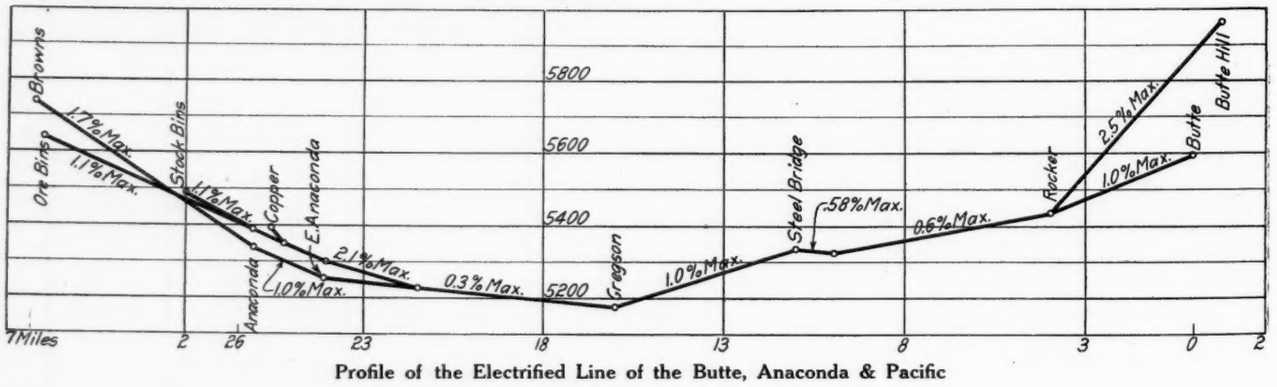
The locomotive equipment consists of 17 80-ton units, 15 for the freight and 2 for passenger service. The freight locomotives are geared for slow speed and are operated in pairs for the main line service. The maximum free-running speed is 35 m. p. h. The two passenger locomotives are of the same construction as the freight units, but are geared for a maximum free-running speed of 55 m. p. h. A speed of 45 m. p. h. is made with three passenger coaches on a straight level track. The continuous tractive effort of a single 80-ton freight locomotive is 25,000 lb. at 15 miles per hour. The maximum tractive effort for a period of five minutes is 48,000 lb., based on a tractive coefficient of 30 per cent.

These locomotives are of the articulated double truck type with all the weight on drivers. The cab contains an engineer's compartment at each end and a central compartment for the control apparatus. The central channels forming a part of the underframe are enclosed and are utilized as a distributing air duct for the forced ventilation of the motors. The air is conducted through the center pins, which are hollow, into the truck transoms and thence to the motors. The motors are of the GE-229-A commutating pole type, wound for 1,200 volts and insulated for 2,400 volts. This motor was designed for locomotive service and is provided with forced ventilation. The gear reduction on the freight locomotive is 4.84, and on the passenger locomotive 3.2. The double unit, 160-ton locomotive is capable of giving a continuous sustained output of 2,100 h. p. The motors are connected to the driving wheels by twin gears similar to those used on the Detroit river tunnel, the Baltimore & Ohio, and the Great Northern locomotives.

The control equipment is Sprague-General Electric Type M, multiple unit, operating the four motors in series and in series-parallel. The two 1,200-volt motors are permanently connected in series. The controller provides ten steps in series and nine in series-parallel. The transition between series and series-parallel is effected without opening the motor circuit, and there is no appreciable reduction in tractive effort during the change. The transfer of circuits at this point is made by a special change-over switch, which is operated electro-pneumatically. The 2,400-volt contactors are operated from the 600-volt control circuit, and are specially constructed to separate the 2,400-volt parts from the coils and interlocks which carry the 600-volt current. The necessary insulation is obtained by large clearances and by the use of porcelain and mica insulation. The armature is connected to the contact lever by a wooden rod. The contacts, magnetic blowout and arc chutes are also especially designed to rupture the 2,400-volt arc.

Current is collected by overhead roller pantographs operated by compressed air. A 2,400-volt insulated bus line runs along the center of the cab roof. These bus lines are connected together by couplers between the two freight units, so that the current may be obtained from either one or two collectors. The air brakes are the combined straight and automatic type; and the compressor is of the CP-26, 600-volt type, having a piston displacement of 100 cu. ft. of air per minute when pumping against a tank pressure of 135 lb. For operating the control equipment and air compressor and for lighting the locomotive and cars, 600-volt current is supplied from the 2,400/600-volt dynamotor installed on each locomotive. The blower which supplies ventilating air to the motors consists of a multivane fan mounted on an extension of the dynamotor shaft. It has a capacity of 7,200 cu. ft. per minute at 4 in. pressure.

Standard 600-volt lighting fixtures will be used on the cars, and each passenger and baggage coach will be wired for five groups of five lamps in series. All of the passenger and baggage cars now used between Butte and Anaconda will be heated as well as lighted by electricity from a single heating unit installed underneath the car floor and supplied from a



Profile of the Electrified Line of the Butte, Anaconda & Pacific

2,400-volt bus connected directly to the 2,400-volt bus on the locomotive. This unit will have a maximum capacity of 25 kw. and will be used to heat the air which is distributed to different parts of the car by means of a small motor driven blower having a capacity of from 500 to 1,000 cu. ft. of air per minute. The motor is connected in series with the heating units. Provision is made for connecting the coils to give a total consumption of 10, 15, 17.5, or 25 kw. The temperature of the car is regulated at all times by a thermostat.

The principal data and dimensions applying to the locomotives are the following:

Length inside of knuckles	37 ft. 4 in.
Length over cab	31 ft.
Height over cab	12 ft. 10 in.
Height with trolley down	15 ft. 6 in.
Width over all	10 ft.
Total wheel base	26 ft.
Rigid wheel base	8 ft. 8 in.
Track gage	4 ft. 8½ in.
Total weight	160,000 lb.
Weight per axle	40,000 lb.
Wheels, steel tired	46 in.
Journals	6 in. x 13 in.
Gears, forged rims, freight locomotives	87 teeth
Gears, forged rims, passenger locomotives	80 teeth
Pinions, forged, freight locomotives	18 teeth
Pinions, forged, passenger locomotives	25 teeth
Tractive effort at 30 per cent. coefficient	48,000 lb.
Tractive effort at one hour rating	30,000 lb.
Tractive effort at continuous rating	25,000 lb.

All apparatus for the electrification of this road was furnished by the General Electric Company of Schenectady, New York.

BANKERS' PROFITS IN NEW HAVEN FINANCING

In reply to a letter of Howard Elliott, chairman of the New York, New Haven & Hartford, requesting a statement of the facts in regard to the bankers' profits in the sale of New Haven securities, J. P. Morgan & Co. have given out the following letter:

We are in receipt of your letter of February 21, asking for certain information covering our relations with the New York, New Haven & Hartford and its allied companies. In compliance with your request and, in the comparatively brief time available, we have had thorough examination made of all our books, the results of which we present herewith in the form of various statements, embracing all our transactions with the New Haven road and its subsidiaries during the past twenty years.

Our relations with the New Haven have been of the following character: from 1894 to 1910 the New Haven generally disposed of its securities by selling them outright, sometimes to us, sometimes to other houses. The securities thus purchased were afterwards sold by the purchasers for their own account, they taking the risk of profit or loss thereon. From December 19, 1910, until December 4, 1913, we acted, under contract, as the fiscal agent of the companies. In the course of these 20 years, from 1894 to 1914, we took part in the handling of New Haven and subsidiary company securities of the par value of $333,000,000, from which our firm realized a total net profit of approximately $350,000, all of the foregoing being set forth below, in detail. All our calculations have included any participations by our Philadelphia, London or Paris house. The transactions are grouped under two headings, viz:

Schedule I. All securities purchased by us either alone or in participation with others.

SUMMARY OF SCHEDULE I

Total security purchases in which we participated	$131,724,000.00	
Amount of our participation in such purchases	78,165,667.00	
Losses realized by us on certain of such purchases		$738,524.56
Total profits accrued to us from all the remainder of such purchases		555,164.42
Net loss to our firm from the total of such purchases		$183,360.14

SCHEDULE II

Section A. Transactions in which, prior to the fiscal agency contract, we acted as agent for the company; the total of securities involved in such transactions being a par value of	$58,851,803.00
On these transactions total commissions paid by the company were	$158,561.13
Being an average commission of less than 3/10ths of one per cent.	
Of this commission, the amount retained by us was	$148,645.25
The balance being paid to others interested with us in the transactions.	
Section B—	
All transactions under fiscal agency contract (entered into on December 19, 1910, and terminated on December 4, 1913) for all companies (including Boston & Maine), showing a total of	$142,507,000.00
of securities sold for account of the companies.	
Upon which they paid total commissions of	$837,605.00
or approximately 5/8ths of one per cent. for selling.	
Of this commission the amount retained by us was	$384,980.01
The balance being paid to others interested with us in the transactions.	

SUMMARY OF SCHEDULES I AND II

Schedule I—	
Amount of companies' outright sale of securities	$131,724,000.00
Schedule II—	
Amount of companies' securities handled on commission	201,358,803.00
In all	$333,082,803.00
Total amount of commissions paid by companies	$996,166.13
Being a little less than one-half of one per cent.	
Total amount of such commissions retained by us	$533,625.26
Net losses realized by us in the outright purchases (See Schedule I)	183,360.14
Difference, representing total profit to us	$350,265.12

This total profit of $350,265.12 (being at the average rate of $17,500 per year) is, as aforesaid, the net result to our firms of all of our transactions with the New Haven and its allied companies during the twenty year period just ended. We have not received from the New Haven or from the companies affiliated with it, any compensation or profit in any form, or on any other account, than those herewith described.

Answering your specific inquiry, we beg to state that none of our firms, nor any member of them, ever had any interest in any properties, such as the Westchester, the steam railways, the trolley lines or the steamship companies acquired by the New Haven Company or any of its subsidiary companies. This broad statement has only one exception, the details of which are as follows:

Mr. J. P. Morgan, Senior, inherited 1,222 shares of the stock of the South Bay Wharf & Terminal Company (being somewhat less than one-tenth of the whole), from his father, in 1890. Seventeen years later, in January, 1907, he was asked to exchange this stock for 814 shares of New Haven stock, and complied with the request. You may be interested in reading copy herewith of a letter under date of January 27, 1906, addressed to him by Mr. J. C. Cobb, explaining the method proposed for arriving, through outside appraisal, at a fair price to the New Haven in the matter. From this you will note that not only was Mr. Morgan's interest small, but that the transaction was carried through without participation by him.

MILLBROOK COMPANY

We are glad to make specific replies to your questions in regard to this company.

(1) We hand you herewith statements of accounts from our books showing that from October, 1906, to September, 1907, we advanced Mr. Oakleigh Thorne, and afterwards the Millbrook Company, various sums aggregating $11,155,000. All these advances were made by order, and for account, of the New Haven. We enclose copy of an official letter to us from the New Haven company, dated April 2, 1907, and received about that date, in which reference is made to an agreement dated December 4, 1906, between the New Haven company and the Millbrook Company, and to our advances on account of that contract. This letter confirms our understanding that all such transactions have been and are "for the account and benefit of the New Haven road" and furthermore that "that road is and will be responsible therefor." We hand to you also a list of the securities against which advances were made, such securities having been finally turned over to the Millbrook Company under instructions of the New Haven company.

(2) None of our firms, nor any member of them, had any

transactions with the Millbrook Company other than those for the account, and by the order of the New Haven company, as set forth in the statements of accounts furnished you herewith.

(3) In none of these transactions was there any profit or commission to our firms or to any member of them. The New Haven company opened with us an account which was designated as its "Account No. 2." In this account the company deposited from time to time (over $8,000,000 of the total prior to February, 1907) moneys to reimburse us for our advances for its account to the Millbrook Company. We enclose statement of that account, showing that any interest paid by Mr. Thorne was credited to the New Haven company's "Account No. 2"; and that we received no interest upon advances made.

(4) The securities thus purchased by the Millbrook Company represented the ownership of those enterprises which afterwards became what is known as the New York, Westchester & Boston Railroad Company. None of our firms, nor any member of them, had any interest in the Millbrook Company, or in any of the securities or property purchased by the Millbrook Company, or received any advantage from such purchases. Nor had we any interest of any kind in any of the enterprises or properties which in any way became a part of the New York, Westchester and Boston.

DEPOSITS

From the year 1903, when the first deposit account was opened with us, the companies have had with us total balances averaging for the eleven years, about $1,415,000 (subject to draft) on which we have paid interest at 2 per cent.

We believe the foregoing covers all the points as to which you ask us. Should any point not be clear to you, or should you desire more detailed information on any point, we shall be very glad to give you explanation or further information you desire.

THE RATE ADVANCE HEARINGS

The Interstate Commerce Commission has issued a bulletin dated February 26, which, however, was not printed until March 6, requiring information in regard to various free services performed by the railroad companies for shippers. Below is summarized the gist of each class of questions and the date at which the answer must be in the hands of the commission:

Allowance of Free Time for Loading or Unloading Carload Freight—March 25, 1914.—Tariffs providing for general demurrage rules are to be cited, with the number of free days generally allowed for domestic shipments, number of free days generally allowed at tidewater for foreign shipments, and a list of all exceptions, with the provisions of the exception, the reasons for the exception and a statement of who benefits, the shipper, the consignee or the carrier, by such exception; estimated cost of the free time allowances per car per day, taking into consideration investment in property and equipment, should be stated.

Collecting and Delivering Freight—March 27.—The general rule as to the point at which transportation service covered by the freight rate begins and ends for C. L. and L. C. L. should be cited; tariffs providing for the railway company to perform drayage service or otherwise help the shipper or consignee, or to deliver freight at points other than those covered by the general rule, should be cited, and wherever the service is performed for particular commodities or at particular points, the details of such service, payment for such service, cost of such service, and the reason for granting such service should be given.

Storing Freight—March 29.—Tariffs that contain general storage rules should be cited; the number of days free storage allowed on C. L. and L. C. L. freight for both domestic commerce and foreign commerce should be shown, and each exception to the general storage rule should be stated, briefly showing the commodity, etc.

Transporting Containers—March 31.—Rules governing the shipment and freight charges on containers loaded and empty should be cited, together with the tariffs making special provision for the transportation of containers either free or at reduced rate, loaded or empty, and where special provision applies only when certain commodities are shipped, each commodity should be stated separately with the provision in regard to it. The difference between estimated weights and actual weights of the various classes of containers should also be shown.

Furnishing and Transporting Dunnage, Preservatives, Etc.—April 2.—The general rule for transporting dunnage, preservatives, etc., in addition to the facilities ordinarily provided against breakage or deterioration for grain doors, linings, etc, provided at the expense of the shipper or carrier; dunnage; ice, salt, straw, etc., whether at the expense of the shipper or the carrier, and whether a charge is made for the transportation service of the above articles. Commodities which are an exception to the general rule should be shown separately and the kind and quantity furnished per car, the cost per car, the charge per car and the average number of cars per month for each commodity.

Furnishing or Paying for Wharfage or Dockage—April 4.—The points where the railroad receives or delivers freight through the use of docks or wharves, including receipts from or deliveries to other railroads, should be shown, and the location of the dock or wharf, the owner, the operator, the names of the other transportation lines served; whether or not the docks are used for receiving from or delivering to shippers direct; general rules in regard to charges for freight handled, and if there are exceptions for certain commodities, each should be stated separately, etc.

Refrigeration Service—April 6.—The general rules and practices governing icing or reicing should be shown, with the list of the principal commodities iced at the expense of the railway, at the expense of the shipper, for which a flat charge is made, for which a charge on the basis of the quantity of ice and salt furnished is made. If certain commodities are made exceptions to the general rule, these should be shown separately and fully explained. The general practice of the railroad as to whether or not it operates its own icing stations, form of contract, etc., and the name of companies or individuals with whom contracts are made for performing such service, should be shown. If ice or salt for refrigeration or the refrigeration service itself is furnished by shippers or private car lines, this fact should be shown together with the name of the station, the name of the shipper, date and circumstances of the agreement, form of contract, price per ton, per 100 lb., etc.; price charged shippers on the same basis, the profit and loss per car to the railroad, the number of cars on which loss is sustained, the loss per year and the reason for making arrangements by which a loss should be sustained, should all be shown. The gross loss without deducting profits on refrigeration service should be shown.

Loading and Unloading Carload Freight—April 8.—The rule as to loading and unloading that is generally applied should be stated and tariffs providing for exceptions showing the loading or unloading performed by the railroad without addition to the rate; the loading or unloading performed by others, but paid for by the carrier, and the service performed by the railroad at its own option without expense to the shipper or consignee for the purpose of releasing equipment; the general rule in regard to loading and unloading freight for export and import, and the cost to the carrier on this account during November, 1913.

Reconsigning Carload Freight—April 10.—The I. C. C. number and title to all tariffs authorizing reconsignment privileges should be shown, and the rules under which the privilege is granted, and as to whether without charge, with charge, and actual cost per car of rendering the service, including interest on capital charges, office, clerical and switching expense should be shown separately for privileges which are accorded to all commodities and privileges which are restricted to certain commodities. Commodities that are accorded the privilege of more than one reconsignment should be shown separately. The benefits derived from the reconsignment privilege to the shippers and by the carrier from granting such privileges should be shown.

Other Special Services—April 15.

Maintenance of Way Section

Next Week in Chicago

The annual convention of the American Railway Engineering Association and the exhibit of the National Railway Appliances Association will make Chicago the mecca for railway engineers and maintenance of way men of this country and Canada next week. While of universal interest to the higher officers, the value of these meetings, and especially of the exhibits, to the roadmasters and foremen should not be underestimated. Many of the most careful students at the exhibits at the Coliseum in past years have been men of these ranks. The roads in the vicinity of Chicago at least can well afford to consider the advisability of sending their more progressive men to Chicago to study the exhibits for a day or two.

The Standing of Section Foremen

The causes of the prevailing scarcity of section foremen have been frequently discussed in these columns by railway officers of various ranks. A letter on this subject on another page, written by a section foreman, is interesting, especially because of the frankness shown in commenting on the subject. The letter tends to substantiate the writer's statement that in one instance, at least, the quality of our present day foremen has not deteriorated. The reasons he gives for the present shortage of section foremen—the low wages, the small chances for advancement and the treatment accorded them—go directly to the heart of the matter. Important as the wage question is, there is no doubt that the problem has been complicated by the treatment commonly received by the foremen. Aside from the question of salary, a superintendent would be rash, indeed, who would attempt to require even a newly hired brakeman to do many of the things that section foremen are now required to do because of agreements made with organized labor. The section foreman problem will never be permanently solved until these onerous conditions are removed and the foremen are given a salary and rank commensurate with their duties and responsibilities in comparison with other employees.

Responsibility for Safe Speeds

Three recent derailments of passenger trains in one month, resulting in the death of 27 and the injury of over 500 people, reported by the special inspector of safety appliances of the Interstate Commerce Commission as due to excessive speeds in view of existing track conditions, show forcibly the responsibility of the division engineer and roadmaster in deciding upon the speeds at which trains may be operated safely. The first duty of every maintenance officer is to maintain his track and structures in such a condition that they are entirely safe for trains at the maximum speeds permitted. If for any reason the track or bridges are unsafe for those speeds he should exert every effort to bring them up to proper condition and should immediately insist on the speeds being reduced to a safe limit. He cannot shift responsibility for accidents to other shoulders by claiming inability to secure the proper material or labor; neither does he do his full duty by simply reporting conditions to his superior officer. Since he is the special officer in charge of the maintenance of the roadway, he owes a responsibility to the traveling public as well as to his officers, and it is part of his duty to adopt all proper means to bring to the attention of, and to urge upon his superior officers, the taking of all reasonable precautions to insure safe travel. Being immediately in charge of the track, he should be the officer to determine the safe speeds of trains and should vigorously protest against unsafe conditions.

FINANCIAL CONTROL OF MAINTENANCE EXPENDITURES

RAILWAY officers on many roads will see conditions on their lines reflected to a large measure in the description of the practices of the typical road referred to in the article on The Seasonal Distribution of Maintenance Work, which appears elsewhere in this issue. This road was selected because it was typical rather than extreme. The seriously detrimental effects of these practices are recognized by railway operating and maintenance officers who realize the lack of economy in the present methods of making expenditures. The recent period of agitation and of decreasing revenues has forced the adoption of remedies for many practices in other departments formerly considered ineradicable. The same tendency is being shown to a limited extent in track maintenance, and is evidenced by the progress made on several roads as outlined in the article referred to.

The principal difficulty, however, is not one of organization, but of financial control and is evidenced by the effect ending of the fiscal year on June 30 upon expenditures, and by the close relation maintained between earnings and expenditures. The present limits of the fiscal year are purely arbitrary. They are nevertheless a very serious obstacle to economical maintenance work. The extent to which the state of earnings is reflected in expenditures for maintenance depends directly upon the financial policy of the interests in control. The officers in direct charge are restrained from the proper and economical administration of the work by these influences, resistance to which many feel is futile. However, a few years ago it was felt by many that it was almost futile to combat the tide of anti-railroad attacks. A change in public opinion has, nevertheless, occurred. Probably a like change may be brought about by similar attacks on present financial policies as they affect maintenance. If those in responsible charge of maintenance work will bring the evils of the present system to the attention of their superior officers in the proper way from time to time, the effect will eventually be felt. The different maintenance of way associations have an opportunity and a duty in this regard which they cannot afford to refrain from performing. It is practically useless to discuss economical methods or standards of materials either in these associations or on individual roads when these relatively small economies may be wiped out many times over by the arbitrary restriction of maintenance expenditures in the most favorable working season. Just as money spent in the rehabilitation of a railway property will be returned several times over so will expenditures for maintenance made during the season naturally adapted to this work show a large return, especially if this is also the season of light traffic, as on most roads it is.

PRELIMINARY CONSIDERATIONS IN TRACK ELEVATION WORK

THE description of the methods adopted by the Rock Island in preparation for and in the early stages of its extensive track elevation work in Chicago, published elsewhere in this issue, emphasizes some points that are not new but are too often overlooked or disregarded in railway work. In the first place, enough time and energy were spent in designing the structures, and in deciding on construction methods to satisfy the engineers in charge that the finished job would be the best possible and that the cost would be as low as it could be made consistent with this quality of work. While this ought always

to be the case, it is not unusual to see improvement work begun on unexpected orders from superior officers before satisfactory plans have been drawn, material ordered or any study made of methods or detailed costs. A hurried estimate is followed immediately by the authority to proceed with the construction and contracts are let or company forces placed in the field in order to make a showing quickly, with the result that economy is sacrificed and often mistakes are made which seriously affect the permanency or serviceability of the structures built. Valid excuses may be offered for this practice in some cases, but in general such extreme haste is not necessary, and the benefits accruing from mature study and careful design are so obvious as not to require enumeration.

In making preliminary studies, the practice of consulting other railways and manufacturers when information pertaining to the proposed work can be obtained is to be commended. Designing engineers, like other men, are largely creatures of habit, and many designs are made which follow previous practice, but which could be improved by the adoption of entirely different ideas developed on some other road. This tendency may be fostered in a measure by pride and perhaps to a greater extent by reluctance to admit that other roads have adopted better practices. Most railway men, however, are broad enough to exchange ideas freely, and this exchange is being furthered materially by association work. In some cases, however, special studies, such as those made by the Rock Island in this case, are warranted.

The extent to which data secured from manufacturers should be used is an open question. In all fairness an engineer should not put a large amount of needless expense upon the companies furnishing supplies or manufacturing equipment for construction work, but on the other hand when a supply company is in a better position than anyone else to furnish the desired data, engineers should not hesitate to accept it. In all cases a clear understanding as to the use to be made of such data and the business relations that may result will eliminate the complaints that now arise regarding the abuses of this practice.

NEW BOOKS

American Railway Bridge & Building Association Proceedings of the 1913 *Convention.* Bound in cloth and paper, 416 pages, illustrated, size 6 in. x 9 in. Published by the American Railway Bridge & Building Association, C. A. Lichty, secretary, Chicago & North Western Railway, 226 W. Jackson boulevard, Chicago. Price $1.

This volume contains the reports of the committees presented at the convention held in Montreal in October, 1913, with discussions, including the following subjects: Water Supply; Track Scales; Sewers and Drains; Motor Cars; Temporary Structures; Snow Fences; Timber Preservation; Cattle Guards, and Tests of Fire Resisting Paints. These reports were considerably above the average of those presented in previous years and were among the best which have ever been prepared for this association. The report on Track Scales is especially elaborate and includes the results of an exhaustive study of this subject extending over two years. Other strong reports were those on Water Supply; Timber Preservation, and Cattle Guards. The proceedings this year required 416 pages, making them larger than those of any previous year. In order to keep the size down they were printed on a lighter weight paper.

Graphics and Structural Design. By H. D. Hess, M.E. Size 6 in. x 9 in., 426 pages, 429 illustrations, cloth binding. Published by John Wiley & Sons, New York City. Price $3.

This text book was written for use in the author's classes, although the treatment has been made as general as possible. The purpose is to acquaint the student with methods used in determining stresses, and subsequent designing, so that he may be able to design both machines and structures for strength. The problems are selected from both the civil and mechanical engineering fields.

Letters to the Editor

A SECTION FOREMAN'S VIEW

Bowie, Ariz., January 19, 1914.

To the Editor of the Railway Age Gazette:

Nearly every number of the *Railway Age Gazette* contains an article dealing with the section foreman, written in most cases by railway officials who thoroughly understand the importance of this branch of railway service. So far I have failed to see anything written by the man whom it concerns most, namely, the section foreman himself.

The prevailing idea that the quality of our present date foremen is deteriorating and is inferior to that of five or 10 years ago is without foundation. I am sure that our foremen of today are far superior to their predecessors, not only in ability and intelligence, but also in a moral way. To praise the section foremen of years gone by is merely another variation of "Those good old times."

The serious difficulty which presents itself to railroads is the limited supply of foremen, and as has been pointed out very often the main reason for this condition is, that the returns for their services are not attractive enough to induce young men to take up this line of railroading. But not only from a financial viewpoint is his position unattractive. The section foreman has been and is treated by railroads more or less like a stepchild. They know that he cannot assert himself and that he is entirely at their mercy, for organizations of trackmen never amounted to much and never will. Favors, such as free transportation, are handed out to him as charity and he never can tell if he will get what he has asked for, no matter how reasonable his request. His responsibility in most cases is far greater than that of any other railway employee and his opportunities to economize for the company and to prevent losses are many, but notwithstanding this his remuneration and his prospects for advancement are smaller than in any other line of railroad work. Any brakeman, starting with a larger salary than a foreman is getting, is more or less sure that in years to come he will be conductor drawing from $125 to $175 per month. A fireman has the same assurance. How many foremen have a chance to ever draw more salary than they are drawing now?

The suggestion to create a supply of foremen by recruiting future foremen from among young fellows in the general offices seems very uncertain. If a position does not offer enough attraction to a common laborer why should it attract a bright young man, who, in most cases, would be miserable if he should have to live on some blind siding without any intercourse whatever. Only one out of about 18 foremen can hope to secure a roadmaster's position and the other 17 will have to hold down sections always.

There is only one way to relieve the situation. Give the section foreman a fair deal, treat him like other employees, encourage loyalty and the supply of good foremen will increase amazingly.

W. E. Schott,
Section Foreman, Southern Pacific.

Tunnel Construction in Roumania.—The Roumanian government has awarded a contract for the Isvor tunnel on the railway line from Sinaya to Moreni. This tunnel is to be about 4 miles in length, and it is expected that it will cost about $2,500,000. Work is to be begun at once and completed within 28 months. The company which has obtained the contract is also engaged in work on the Hauenstein tunnel, situated on the Basel-Sissach-Olten line of Switzerland. That tunnel is to be 26,700 ft. long. Satisfactory progress is being made, for 14,500 ft. have been pierced on its south side and 6,700 ft. on the north side, so that the work is well ahead of the contract time. Some of the plant in this tunnel will be used in the other tunnel.

Method of Preparation of Burnt Clay Ballast

A Description of the Process of Converting Heavy Gumbo Into the Material Extensively Used on Western Roads

By J. C. Harvey

Burnt clay has been used in England for a great many years for walks, private roads and public highways, and it is also used for railroad ballast. In the United States the first clay was burned by an English company at Hyde Park, Chicago, in 1882, for making roads and walks. This company has since divided into two companies, which have burned a considerable amount of clay for railroad ballast.

SELECTION OF MATERIAL

It is very important that great care be used in selecting a site to burn clay that will make acceptable ballast. The place selected must be low level ground in a valley near a creek or river, but not subject to overflow. Should a pit be overflowed it would have to be relighted, which is quite a large item of expense both to the railroad company and to the contractor. The next thing is to select a site where the top soil is a sticky gumbo, if possible. Gumbo is a loamy soil with a sufficient amount of clay in it to make it plastic. When worked up in the fingers it resembles black wax. However, if the top soil is a sandy loam only five or six inches deep with a deep bed of good clay underneath it will make good ballast, as the fine dust resulting from burning sandy loam soil will be such a small per cent. that it will not lessen the quality of the ballast or choke the fires during the burning process.

The clay necessary for the production of good ballast should be heavy, plastic, free from sand, gypsum, or other impurities, and must not crumble into fine particles when exposed to the air or when it comes in contact with heat. There is a class of yellow clay that will not make a good grade of ballast as it crumbles into fine particles when it is exposed to the air and slacks into dust like lime. The general rule is, that any soil that is sticky and plastic resembling wax, will do to burn for ballast, provided, of course, that it does not contain a large amount of impurities.

Clay results when granite, gneisses and similar minerals are decomposed. Pure clay is a hydrated silicate of alumina, containing about 46 per cent. silica, 39 per cent. alumina and 14 per cent. water. The common impurities of clay are organic matter, fossils, carbonate of lime, oxides of iron, sulphide of iron, sand and gypsum. For ballast, the clay should be high in iron, lime and the alkalies so that it will vitrify well in burning. The red color of burnt clay is caused by ferric silicate in the clay.

Fig. 1—Old Ties Piled on Clay Preparatory to Starting Fire

After the site has been selected, test holes should be dug about every 150 ft. for the full length and width of the area to be burned, to determine the quality of the clay, and especially the depth to which it extends, as there is sometimes a bed of sand under the bed of clay or the clay may contain such a large amount of impurities that it will not make good ballast. A small fire should be made in the vicinity of the test holes and some of the clay burned to get an idea of the kind of material the burnt clay will make. A bed of good clay not less than 6 ft. in depth is preferable, as a shallow layer of clay does not furnish sufficient material to build the fire high enough to get the best results. The higher the face of the fire, the better is the ballast, the less the amount of coal used, and the greater the progress.

BURNING THE CLAY

The fire for a ballast pit is started by first throwing up a breastwork of the clay about 4 ft. high and then scattering a 1 in. layer of slack coal or coal screenings on the top and face.

Two layers of old ties are then laid against the face and on the top and a small amount of coal is scattered on the ties. A man then comes along with a bucket of coal oil, and a dipper with which he throws the coal oil on the ties, and the ties are then lighted. They are allowed to burn from 15 to 30 minutes before the excavating machine, working two drag buckets, comes along and throws 8 to 10 in. of clay on the fire. A person unfamiliar with the work would immediately come to the conclusion that the fire was being smothered, but it continues to burn, not so fast, but just as well as if exposed to the air. Two days later the slacking machine scatters about 1½ in. of coal on the top of the clay. As the heat comes through, this coal catches fire and holds the heat in so that the clay becomes hot enough to receive the next layer of clay, which is put about five or six days from the time the fire was started. After the fire is under headway this process continues with a layer of clay ten or twelve inches thick applied every five or six days. The layer of clay being covered is only half burnt and is yellow in color, but is fully burnt within the next six days and becomes red in color.

In applying the layer of clay to the fire, the face and top is first raked with a heavy iron rake about 8 ft. in width, having prongs 3 in. in diameter spaced 1 ft. apart. The top of the fire is always the hottest so the top is pulled over and allowed to roll down the face towards the bottom of the pit. The steeper the incline of the burning clay the better the results will be, but it will not stand a slope steeper than 52 deg. After the surface has been well raked, a small car holding about 2 tons of coal is run out over the fire on a track supported by booms and a layer of coal from 2 to 3 in. thick is scattered on the thoroughly hot clay. The thickness of the layer of coal depends on the thickness of the layer of clay that will be next applied. For a coat of clay 1 ft. thick, and working with the object of burning 4 yd. of ballast to 1 ton of coal, a layer of coal 2¾ in. thick is the average applied. This average is from actual calculation of work at the pit, and is derived by dividing the cubic feet of coal used on a given stretch by the number of square feet of bank covered. As it takes a layer of coal 4.45 in. thick, theoretically, to burn 4 yd. of clay to 1 ton of coal, the balance of the coal is scattered on the top of the clay or outside surface. Of course, in actual work these figures vary a little both ways. After the fire is raked and the coal is applied, the excavator throws on the clay.

Fig. 2—Scattering Coal on the Face of the Fire

"GREEN SPOTS" AND CLINKERS

Frequently there are "green spots" or places in the fire that are backward in burning. At these places holes are punched with iron bars to give ventilation after which they start to burn and catch up with the rest of the fire. Another defect in the burning is what is called at the pit, "black spots." At these spots the coal does not burn out, but has been smothered so that it produces coke and turns the clay as black as coal. These black spots are caused mainly by throwing upon the fire a large amount of fine, dry dust mixed with the clay, which smothers it and prevents the proper combustion of the coal. These black spots have been known to stay hot and not burn out for a year and a half, although the ballast all around them has become cold. When the black spots are on the face of the fire, the only way to handle them is to dig them out and start the fire again with wood. If they appear on the top of the fire they can be raked over on the face of the fire and burned out.

To avoid this dust and fine material that causes these black spots, all loose clay in the trench from which the clay is being excavated should be thrown on the fire while the excavating is in progress. In this way there is nothing left in the trench to crumble and make dust. Also, the side of the trench that is being excavated should be kept almost vertical. If this is done the clay will fall in the buckets in lumps. Where the trench is taken out on a long slope or slant, the clay collects in front of the bucket and is pulverized into small particles which do not make the best quality of ballast. If part of it is allowed to remain in the trench it then becomes dust when allowed to dry, and when thrown up with clay will choke the fire. For ballast the burnt clay also should not have a very large per cent. of

dust and fine material, as it is washed away to a certain extent during heavy rains. In carrying on the burning the bottom of the fire must receive careful attention. It should be dug out each time a coat of clay is applied, and a liberal amount of coal scattered there, otherwise there will be about 1½ ft. of half burnt yellow ballast that will have to be rejected.

A very common objectionable feature of burnt clay is the number of large clinkers formed in the ballast beds during burning. As there are many places in ballast pits where the clay is burned perfectly and there is not a sign of a clinker, it shows that with correct treatment clay can be burned without a great number of clinkers. Clinkers hinder the loading machine in loading into cars, clog up the bottom of dump cars in unloading, thus spreading the ballast unevenly in the track, and delay the work-

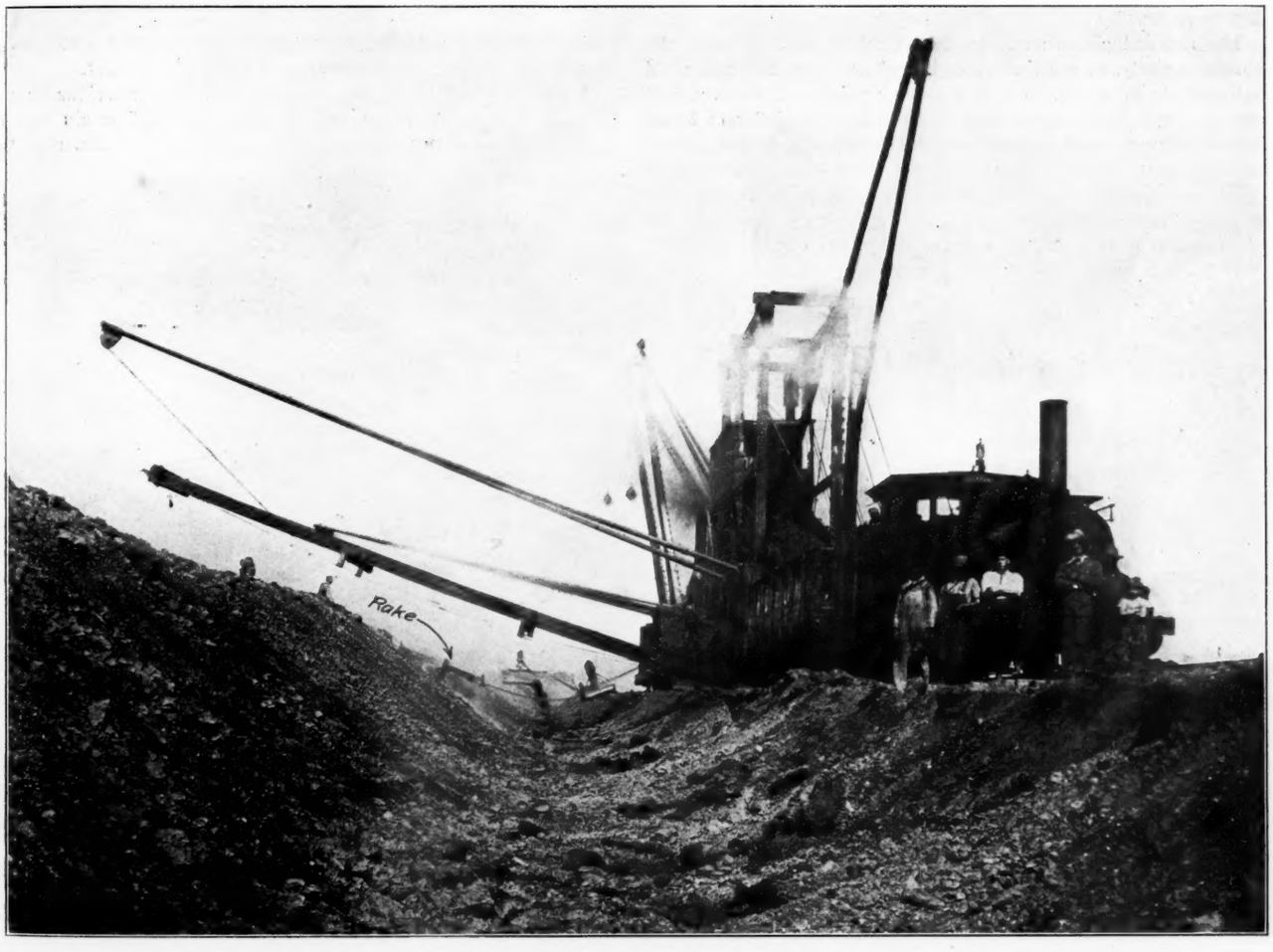


Fig. 3—Raking, Slacking and Covering the Fire

train, running up the cost of the ballast. Where a great amount of clinkers are unloaded they cannot be put in the track and the track gangs have no time to break them up; consequently they are rolled out on the right-of-way, giving an unsightly appearance and making them a nuisance in many ways, especially in cutting weeds on the right-of-way. For these reasons the contractor is generally required to break all clinkers into pieces not larger than 8 in. in diameter before loading into cars.

Clinkers form almost entirely at the top of the ballast beds and extend 3 or 4 ft. downward. They are caused mainly from an excessive amount of heat in burning the clay. Even from this cause they can be eliminated to a great extent by raking deep at the top of the fire. As the heat in the ballast bed is going upward all the time the top is very much hotter than any other part, and should not receive as much coal. The clinkers form in the second and third layers of clay from the top, and sometimes layer after layer becomes amalgamated forming a large solid mass. The particles of clay that are forming clinkers are red hot and are easily torn to pieces if raked well and deep. Most of the clinkers formed are masses of burnt clay, the particles of which are held together by something that looks like sodium aluminum silicate, or glazing used on earthenware, while others have a regular coal clinker mixed in with the mass. Another cause of clinkers forming in the ballast beds is a strong wind blowing continuously in the face of the burning ballast. This possibly prevents a proper escape of the gases during combustion and causes a precipitation of their impurities in the clay. It has been noticed that during the especially windy months in the summer, an unusual number of clinkers were formed in the ballast, and in some places where the clay was only half burnt. Most of these clinkers could have been avoided by thorough and deep raking.

ORGANIZATION AND OUTPUT

An excavating machine can excavate 1,200 yd. of clay in a day. It has two drag buckets with a capacity of 0.8 yd. The loading machine has a drag bucket of about 1.5 yd. capacity and can load 32 cars or 1,000 yd. a day. On one occasion 57 cars, or 1,828 yd. were loaded in a day. The cars commonly used are the Hart convertible Rogers ballast center dump cars. A car inspector is generally stationed on the ground during loading to examine all cars, to see that the center dump is properly closed, to make all minor repairs, and to tag and report all cars found to be in bad order.

In laying out a yard for a ballast pit there should be two storage tracks for coal cars, one for loads and one for empties.

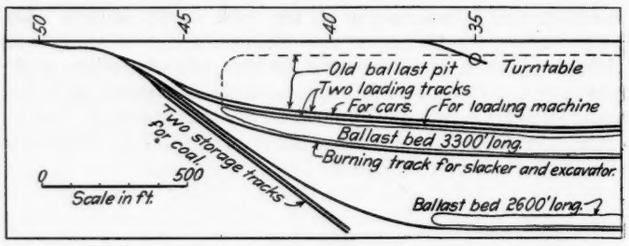
If many foreign cars are being used, there should be an additional track for foreign cars so that these cars can be unloaded first and released without a great amount of switching. Where it is necessary to haul water to the pit in tank cars, it will save a great deal of switching to have a short spur on which to set the tank car. There is also a burning track on which the excavator and slacking machine work, and two loading tracks on the back side of the pit, one for the loading machine and the other for the train of cars to be loaded. As the tracks at the pit are constantly being shifted, the ballast contractor keeps a track gang working all the time, throwing track and keeping the tracks in shape for the machine to run over.

An average of 30 men are employed at one pit where there are two fires burning; one 3,300 ft. long and the other 2,600 ft. When the loading machine is working also, an average of 35 men will be required.

The railroad places an inspector on the ground to watch the burning closely, to see that enough coal is being used and good ballast is being made, to keep records of the coal received and used daily, to watch the ballast that is loaded in order to reject all poor material, and to cross section the ballast beds each month for monthly estimates. Railroads usually let the contract to some burnt clay ballast company who furnishes all machinery and men. The railroad furnishes the land, which costs from $50 to $150 an acre, and furnishes all tracks necessary to carry on the work.

The cost of burnt clay ballast varies and is effected by several items, one of which is the length of haul of the coal. Another item that affects the cost is the frequent necessity of building a levee around the ballast pit area to prevent overflow of the pits. The cost of land is another item. To burn the ballast, haul it and put it in the track will cost the railroad company from 80 to 85 cents a yard.

Burnt clay used as ballast for railroads makes a very elastic roadbed, is free from dust, and very easy to handle in keeping the track in good line and surface. Trains run over burnt clay ballast with a smoothness that is in great contrast to heavy pounding of rock ballast. In making tie renewals in burnt clay ballast the cost is a third cheaper than in broken stone. Weeds and grass can also be cleaned from burnt clay ballast much cheaper than in broken stone, and they do not grow in burnt clay until after the winds have carried dust from the adjoining soil into it. Another advantage is the ease with which a small gang of men can surface rough places as it is readily worked.



Typical Layout of Pit for Burning Clay Ballast

A cubic foot of burnt clay perfectly dry usually weighs about 60 lb. It absorbs water very readily and will retain water to as much as 16 per cent. of its dry weight. It commences to absorb moisture as soon as it is exposed to the atmosphere, and in the track contains enough moisture to bring its average weight to about 65 lb. per cu. ft. It will absorb an ordinary shower of rain and thus protect the ties to a considerable extent from decay. By taking quite a number of samples it was found that in a cubic foot of burnt clay weighing 60 lb. an average of 30 lb. passed through a ½ in. mesh sieve, 30 lb. was caught on a ½ in. mesh, 48 lb. passed through a 1 in. mesh and 12 lb. was caught on a 1 in. mesh.

Burnt clay ballast under heavy rail will withstand very heavy traffic, but probably under the heaviest traffic will not equal ballast of a greater specific gravity. It is used extensively on a number of Western roads. The Chicago, Rock Island & Pacific is one of the largest users of burnt clay ballast. On the Kansas division about 150 miles of track is put up on this material, and there is also some on the Missouri, Nebraska and El Paso divisions. On the Kansas division 50 miles from Caldwell to Wichita

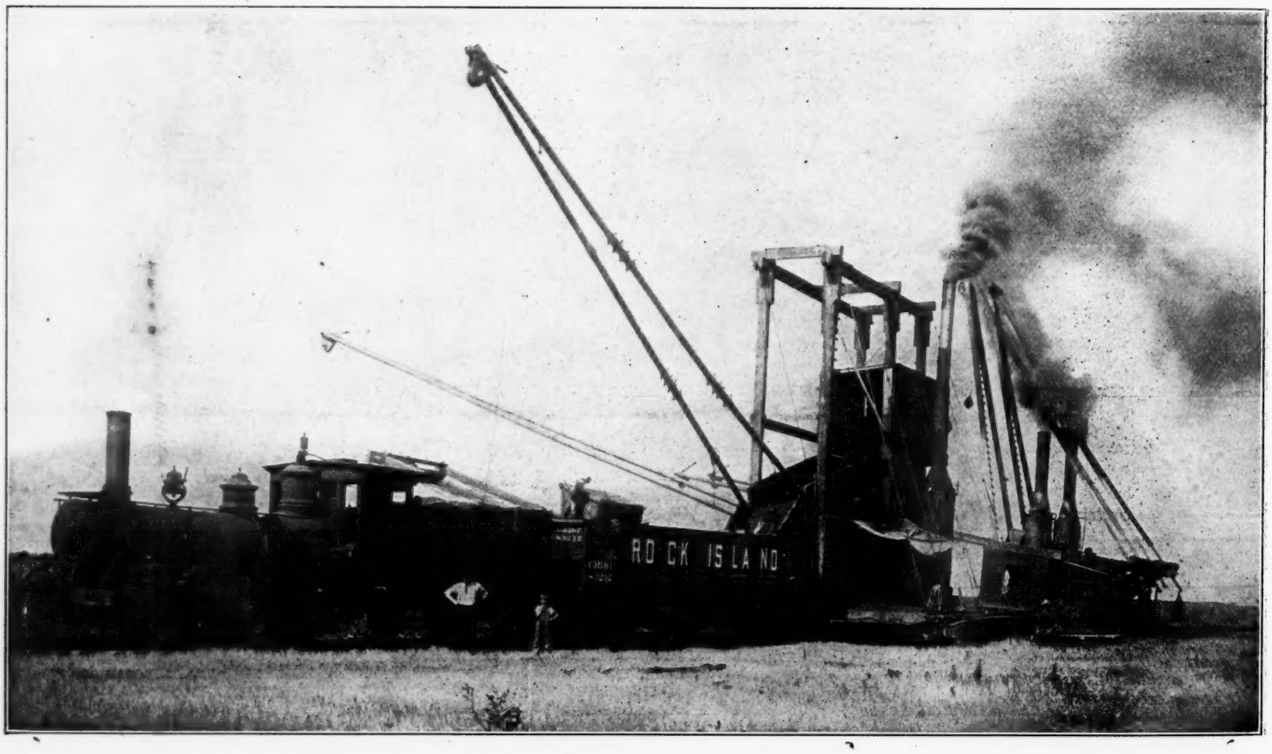


Fig. 4—Loading the Burnt Clay Ballast

and 50 miles between Herington and McFarland have been ballasted for two years. There is also 50 miles of burnt clay ballast between Horton and Topeka.

It has been found that the track on each of these stretches is the most easy to maintain of all the track on the division. The 50 miles between Herington and McFarland is holding up with little or no work, and this is the hardest piece of track to maintain on the division on account of an eight-mile grade of 0.8 per cent. This track has carried a very heavy traffic and has received little or no attention since it has been put up in 1911, but the line and surface are still very good.

MERITS OF BURNT CLAY BALLAST

By W. Shea

Roadmaster, Chicago, Milwaukee & St. Paul, Ottumwa, Iowa

If properly placed a good quality of well burnt gumbo ballast will make a strictly first class railroad regardless of heavy power and traffic. Some roadmasters may think this a broad assertion. They may claim, perhaps that this ballast is not hard enough and that it crushes under heavy power and loads, also that tamping it with picks and bars will pulverize it and thereby cause the ballast to puddle under the ties. In the past such ideas were advanced, but in 25 years' experience with this material, I have found that these objections are not borne out.

I first began using gumbo ballast in the northern part of Missouri on a new road bed, under 60-lb. rail. In those days with plenty of help, it appeared as if considerable excess labor was consumed in maintaining good surface and especially in keeping up joints (we had even jointed track). To insure good tamping, bars and picks were used instead of shovels, but in some cases during wet periods, especially where the drainage was not good, the joint ties puddled and the rail became surface bent. The supposition was that the ballast was at fault and consequently thousands of dollars were expended in replacing rail joints, tamping picks and bars were abandoned, and the ballast shoulder, which had been raised to the level of the top of the ties, was cut down to one-half inch below the bottom of the ties to afford better drainage and avoid the puddling of ties. After this was done, our joints still continued to go out of surface, and naturally it was thought that the ballast was too light.

The rail was then replaced with 75-lb. rail, laid with broken joints and the power was increased to 100-ton engines. The track was re-surfaced in most parts with a 6-in. minimum lift of burnt clay ballast. The shoulder was made uniform from a point 2 in. below the top of the ties to sub-grade with side slopes of 2½ to 1. After this, a decided improvement was noticed, the puddling of the joints ceased, and we incurred very much less expense in keeping up the track. Later on, after the 75-lb. rail was worn out, it was renewed with 85-lb. and 90-lb. rail, and the track was given another light raise on burnt clay ballast. At the present time, that part of the Kansas City division of the St. Paul between Ottumwa, Iowa and Kansas City, Mo., a distance of 200 miles, is practically all on gumbo ballast, and I will venture to state that this piece of track is as good, and can be maintained as economically (if not more so) as if it were laid with any other kind of ballast. Other parallel lines with crushed stone and other ballast have not as good track after spending more money for maintenance. The experiences related above have fully demonstrated, in my mind, that the previous trouble was with the road bed and not with the ballast. The roadbed was new, the banks too narrow, and the rail too light.

Some roadmasters who have had experience with gumbo ballast may not agree as to the merits of this ballast, especially those who have not given it a thorough trial. It is for this reason that I am endeavoring to show that other conditions than the ballast are at fault. The conditions between the Mississippi and Missouri rivers, and especially in southern Iowa and Missouri, are different, from the standpoint of the maintenance of track, from those in any other part of the country. More ballast is required under the track to maintain it than in other parts of the country. In places from 18 to 30 in. is required. If this were the average grade of gravel ballast, I doubt if the track could be kept in line on account of the looseness of the gravel, but the clay ballast bonds and no more trouble is experienced with maintaining the line of track than with crushed stone ballast.

In placing the ballast, we make two lifts the same as with stone ballast, the gang making the first lift being about one week ahead of the second lift gang. Gumbo ballast can be laid and handled for much less than crushed stone. The track is dressed the same as with stone, all coarse ballast being raked out or burned. After being laid burnt clay is dustless and makes an easier riding track than any other ballast, for it is not as rigid as stone and is much cleaner than any other ballast. Also on account of the gumbo ballast not being as rigid as stone or gravel, I do not think the rail cuts into the ties as badly as it does on the other ballast. Regarding the life of burnt gumbo ballast, the Davy Clay Ballast Company burnt a pit in North Missouri in 1888 which we put under the track in 1889 and 1890. In 1909 a flood washed out 30 miles of this track and strong, well-packed ballast was found in the banks that were washed out, showing that it was in a good state of preservation after being under track 18 and 19 years. I am of the opinion that if the roads were to make a more thorough study of gumbo ballast, there could be considerable money saved in the maintenance of their track and equipment.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since February 20, 1914:

A Study of Interior Transverse Fissures in Rails.—An extensive report on this important recent defect in rails prepared by Dr. P. H. Dudley, consulting engineer, New York Central Lines, for President A. H. Smith, was published in the issue of February 27, page 415. This article describes the results of a large number of tests of rails in which this type of fracture had developed. An editorial comment on this article appeared on page 411 of the same issue.

Simplifying the Tonnage Rating Problem.—The method of tonnage rating used on an important trunk line railway for four years was described and illustrated by several curves in an article by R. N. Mounce in the issue of February 27, page 427.

Grade Separation in McKees Rocks.—The elevation of a line owned jointly by the Pennsylvania and the Pittsburgh & Lake Erie, at McKees Rocks, Pa., was described in an illustrated article in the issue of February 27, page 429.

Promotion of Engineers in Railway Service.—A short editorial note commenting upon the numerous promotions of engineers into the operating department recently, appeared in the issue of March 6, page 454.

Track Elevation Subways in Chicago.—A careful discussion of the development of track elevation subways in Chicago from the time of the construction of the first Illinois Central viaduct in 1892 to the structures now being built on several roads, by W. S. Lacher, office engineer, Chicago, Milwaukee & St. Paul, Chicago, was published in the issue of March 6 page 459.

Union Station and Track Elevation at Wichita.—The elevation of the tracks of the Santa Fe; Rock Island; Frisco and Orient railways through Wichita, and the construction of the new union station costing altogether about $2,000,000, was described in an illustrated article by C. J. Skinner, engineer in charge of these improvements, in the issue of March 6, page 470.

In making surveys for the Murfreesboro Electric Railway between Nashville, Tenn., and Murfreesboro, 8.7 miles of preliminary surveys were run by a transit party of six men in one day.

Railway Construction in India.—It is reported that the railway board has sanctioned a survey to be carried out by the Bengal-Nagpur Railway for a railway line of 2 ft. 6 in. gage from Drug, a station on the Bengal-Nagpur Railway, via Batser, and Jaipur to Salur or some other point on the Vizianafram extension of that railway, a distance of about 377 miles.

The Construction and Maintenance of Track Scales

Abstract of an Elaborate Committee Report of the American Railway Bridge and Building Association

Taking the number of track scales owned by roads having one tenth of the mileage and one eighth of the freight cars in the United States and figuring proportionately, there were 3,012 track scales in the country owned by the railroads the first of last year. Taking such data as are available, it is estimated that during the year ending June 30, 1912, there were moved by the railroads of the United States 25,000,000 cars loaded in carload lots. The freight charges on these are estimated at $1,000,000,000. Each track scale weighed 8,300 cars and measured $332,000 of revenue. If the scale weighed this amount one tenth of 1 per cent. under the actual, the road owning it was loser to the amount of $332. If a scale weighs a car weighing 32,000 lb., and its contents weighing 40,000 lb., 150 lb. less than the actual weight, it is giving more than double this error. If it weighs such cars 400 lb. short it gives a loss of revenue of one per cent. This will pay for an average scale every year and for a very high class scale every two and a half years. The cost between a faulty installment and a good one is about half this estimated possible yearly loss.

Observation of all types and makes of track scales in various parts of the country leads to the belief that it is a mistake to secure too great a measure of refinement in the track scale. If a scale is graduated on the secondary beam to weigh 50 lb., and is sensitive to half this amount when new, much better results will be had than if greater sensitiveness is sought. This is empirical, but has a basis derived from tests on the wear of the knife edges of several scales. When a scale knife edge breaks or wears it destroys the multiplication at that point and produces a constant error. The American Railway Association recommends that the sensitiveness of scales should never be greater than 100 lb., and when the scale is new should not be greater than 50 lb.

The question of the scale overhang is one to be considered. It will be seen that when the wheel of the oncoming car "falls" across the opening between the scale rail and the track rail on a scale with no overhang, the blow strikes the weigh bridge beyond any support, and the full weight on the pair of wheels is precipitated upon the bearings of the first section in such manner as to give a leverage, increasing the load, perhaps, 12 per cent. and also giving a tilting action to the weigh bridge which has a tendency to lift the bridge from the bearings of the second section, and has in some instances been thought to injure those bearings. This was until recently the universal manner of construction.

In a design used by the Pennsylvania Railroad, Baltimore & Ohio, Southern and other roads, the opening is placed between the scale rail and track rail directly over the first bearing. This brings the full shock of the impact directly on the bearings of the first section. This is thought by some to be especially injurious as there is nothing to break the blow save such cushion as may be provided. It avoids the injuries caused by the supposed tendency of the weigh bridge to tilt, but it brings the entire load of the wheels directly over the most sensitive part of the scale. The Bessemer & Lake Erie, Carnegie Steel Company, and several other companies increase the overhang so that the opening between the scale and track rails will be at a point variously one-sixth, one-fifth and one-third of the distance between the first and second bearings of the weigh bridge. Besides dividing the load between the two bearings, this brings the shock where all possible slight deflection of the parts is utilized to modify the shock of the blow or impact before it reaches the knife edge of the section. This form of construction makes a long section and increases the cost of levers and weigh bridge.

The question of the length of the track scale is one of importance, and one for which hard and fast rules can not be made. The recommendation of the American Railway Association is that the scale be long enough to weigh the cars offered, and preferably longer. It is not likely that the average car will grow shorter. The answers to the queries sent out show a diversity of lengths of scales, 40 ft. being the shortest length recommended and 67 ft. the longest. The latter is for gravity weighing.

The capacity of the scale is a matter over which there is a large amount of confusion. The scale companies give their scales an alleged capacity of 100 tons, 150 tons or 200 tons. The average buyer supposes this to mean that it is calculated to weigh correctly and without undue wear or injury to the scale, a load in the usual car up to that amount. It is not clear as to how the scale companies arrive at their rating.

It seems the accepted practice to place the scales, wherever it is possible to do so, on a track over which no switching is done. It also seems the general recommendation to place the scales on a track only long enough for the purpose of weighing. The extreme length of such a track was reported by the Duluth & Iron Range, where the scale track above the scale is long enough to hold three full trains, and below to hold one full train. The minimum length of a scale track is such as will give a tangent each side of the scales equal to the length of the longest car in service which will be weighed. This distance should be on the same gradient as the scales themselves, and preferably level.

Pocket track is a name given to a short track leading to and across the scale, and used for no other purpose than weighing. It may be either stub or double end. Where it is used a scale without a dead rail is installed. Using a pocket track and locking the switches leading to it with Yale locks has proved a very successful way of keeping engines off the scales. The disadvantage of this plan is that it requires more track and space than the dead rail method, and the advantage is its greater safety from being used by engines and the fact that it dispenses with the dead rail and permits making the pit one and one-half feet narrower. The deck of the scale, if of a rigid type, can be made very much lighter, as it carries little in addition to its own weight.

Are dead rails necessary? This is a question of growing importance as the railroads install better scales. With the old type of scales it was considered almost suicidal to permit engines to cross on the live rail. The modern track scale is designed to take care of modern loads and for that reason a locomotive passing over it is less harmful than it was when the scale was designed to weigh only the lighter loads. The scales of most of the roads handling iron ore in the Lake Superior district are built without dead rails and the engines run over the scales in weighing. The speed is slow and the draw bar pull kept very light and even. The committee is of the opinion that allowing engines to run over the live rail of a scale puts an undue strain on a scale, tends to excessive wear on the pivots, and shortens the useful life of the scale. This practice should be limited, or if possible, prevented.

Such of our correspondents as expressed an opinion concerning scale beams advocate a steel beam, as it is thought that the required stability is not to be obtained by any other metal. One correspondent recommends a beam of cast iron with a steel bar doweled in with graduations on the steel bar. The numbers are preferred on brass, but some advise japanned white on steel. The beam should be so rigid that under working load applied in a testing machine, the deflection of the tip from the line of the pivots shall not exceed one tenth of an inch. For some hand work a double beam is preferred. The weighman sets off the tare on the upper beam, and gets the weight of the contents on the lower beam without any computing. Where a Streeter-Amet recorder is used, best results will be obtained if the multiplication to the butt of the beam is not over 400. A multiplication of 800 is common for hand weighing.

Prominent factors to be considered in the location of a scale are: convenience in switching, facilities for handling cars between the scale and the yard tracks, track connections, gradients, alinement, track spacing, drainage of scale pit, length of scale tracks, etc. The location of the scale should be such that trains using it will not interfere with streets or road crossings. Special consideration is to be given to the drainage and foundation, and if there is doubt as to proper natural drainage or as to the bearing power of the soil, a test pit should be dug and the soil formation noted. If proper drainage cannot be obtained, the scale pit should be made thoroughly waterproof and a sump and pump provided for removing any water that may enter.

If test pits are not dug, the soil should at least be sounded with rods to determine its character and sustaining qualities, and the foundation proportioned accordingly. The St. Louis & San Francisco adopts the following assumptions for a 50-ft. 150-ton track scale:

Load on side wall next to scale house, 3½ tons per lin. ft.
Load on side wall opposite scale house, 2 tons per lin. ft.
Load on two end piers supporting lever stand, 76 tons each.
Load on two center piers, supporting lever stand, 102 tons each.
Load on two end walls of pit, supporting ends of scale rails on approaches, 30 tons each.

In order to avoid joints, it is desirable to provide track rails the length of the platform for scale rails and two feet longer for dead rails.

All material (unless it be the scale mechanism and the weight bridge) should be assembled before a force is sent to install the foundation. In all cases the engineering department should be in charge of construction of the scale pit, foundation and drainage. Concreting should be done with the aim of making walls, piers, etc., as nearly monolithic as possible. All parts should be finished to correct line and grade. Great care should be exercised in setting the anchor for the fifth lever, as this is the center of the scale.

The walls and piers should be built the required level, with an allowance for shrinkage. The top is best finished with 1 to 1 cement mortar, 1½ in. thick. Time must be allowed for the proper setting of the cement (which is ordinarily not less than 10 days). Then the castings should be set with a level being used to ensure their accuracy. The installing of the scale and weigh bridge and placing of the rails on the scale and approaches should be done by an experienced man. If the scales are bought subject to an acceptance test, this work should be done by a representative of the scale company.

DEFECTS

Some of the most common troubles which cause a scale to weigh inaccurately are named below:

1. Troubles due to carelessness of weighmaster: improper balance, scale out of balance, and another car partly on scale.
2. Troubles due to weakness of scale: deflection of scale bridge, and deflection of levers.
3. General troubles: deck binding, rails binding, broken castings, broken bearings, dull bearings, bearing feet resting on angle irons, insufficient clearance between bearing feet and scale timbers, levers out of line, fifth lever out of line, main lever loose, and foreign matter in friction with levers or scale parts.

A common cause of improper balance results from the weighmaster putting his free hand on the scale beam to steady it and bring it more quickly to a rest. It has been observed where a weighman had this habit that he has caused an error of 1,400 lb. in weight of a car, and it is always too light.

The scale may be out of balance from losing lead from the poise or counterpoise, or from the improper placing of the latter.

Those troubles due to a scale of insufficient strength are subject to but small chance of remedies at our hands. Where it is a weak scale bridge it may be feasible to strengthen it. This is easier with the old style wooden girder than it will be with the steel work now sometimes being used. Where two timber stringers form each side of the scale bridge, it is comparatively easy to use a truss rod between them, much as truss rods are used under wooden freight cars. If there is space on the sides, this plan can be used also with a single 12 in. x 18 in. stringer, or a plate of steel can be bolted to the side of the stick, covering from two-thirds to all of the length. Care should be exercised to get the right size of plate, so that the deflection of the timber and plate will be equal. It may be possible to gain the desired strength by replacing the 12 x 18 in. stick with two 8 x 18 in. sticks.

The weak lever may be accompanied by a weak girder. In such a case the deflections may be reduced somewhat by strengthening the girder so as to reduce the springing, and by having the cars handled carefully so as to reduce the jars on the scale. It is fortunate that most of our weak scales have cast iron levers, in which the deflection before rupture is quite small.

In the old type of scales, the deck is supported from the scale levers, and yielding of their foundations or at the bearings may cause the deck to bind. When this trouble occurs, when the levers are out of line or the main lever is loose, it is well to overhaul the scale and strengthen the foundations. It may be that it needs only the renewal of a rotting timber or the cutting off a rotten pile and re-capping it. The mudsills under the framing may need to be renewed or rebedded, or to have their number increased. It may be possible to check settling by increasing the spread of the foundations and so reducing the load per square foot as to keep within the bearing power of the soil.

In connection with the causes of inaccuracy in scales, a report of the Railway and Warehouse Commission of Minnesota shows that out of 310 track scale inspections, in 158 cases the scales weighed the 100,000-lb. test car correctly; in 26 cases it was weighed too heavy, and in 126 cases it was weighed too light. The causes enumerated for the incorrect results are as follows:

Working parts out of level	89
Binding	59
Poor foundation	54
Rusty and dirty pivots and loops	25
Improperly built	22
Working parts frozen up	14
Shifted leverage	13
Broken parts	10
Dust laden poise	4
Worn pivots	3
False balance	2

It is to be noted that in the 310 inspections the first three defects were found 202 times, while all the others combined were found only 93 times. This indicates that improved foundations and better bearing of scale parts on the timbers would have avoided two-thirds of the defects. We might properly go further and include the 22 cases of improperly built scales, and thus lay three-fourths of the troubles to this group of defects. With the better class of the older scales it is probable that it would pay to renew the timber foundation with concrete and the timber girder with steel, the work being done in such a way as to permit of installing a higher class of scale in the future.

The more common defects and ailments found in general observations of the track scale and suggestions for their remedy are noted below:

Binding of the deck may be caused by not having allowed sufficient clearance between the stationary parts and movable portion of the scale platform at the time of installation; by coping timbers not being properly anchored to foundation walls, allowing them to be forced in toward the scale platform by frost or other influences; by the scale platform not being sufficiently checked, allowing the platform to shift on its bearings to the extent of binding against stationary parts; and by timbers under bearing stands decaying or crushing, throwing platform out of level. At the time of installation the scale platform should be cut to give at least ½-in. clearance around the edge and around the pedestals (if there are any) to support the dead rails. All openings should be cut with a bevel edge on the under side of the deck to prevent obstructions from becoming wedged in the openings. The coping timbers should be anchored to the foundation walls to prevent shifting, and where the dead rail is la[illegible]

on the outside of the coping it is sometimes necessary to anchor this by anchor rods secured to posts set in the ground outside the coping wall.

The platform check rods should be so adjusted as to allow from ⅛ to ¼ in. swing to the platform. If the platform binds on account of the bearing supports being out of level, it is necessary to make substantial repairs by renewing the defective parts of the foundation.

Binding of rails is a very common trouble, and one for which there is little excuse, as it is generally caused by the rails not being properly anchored on scale platforms, or by the approach rails not being properly anchored to prevent creeping. The rails on the scale platform should be secured in place by bolts passing through the rail base and down through the platform girders or stringers. Where these rails are laid and spiked on ties which are anchored to girders, or where they are spiked to deck planking, the base of the rail should be slotted for the spikes at frequent intervals.

It is almost impossible to maintain a proper clearance between scale rails and approach rails on account of expansion and contraction of approach rails, unless some substantial means of anchoring these rails is provided. While some success has been experienced with certain anti-creepers, we do not believe they are a general success in such cases. Probably the most efficient and reliable means of securing the approach rails to a proper position and maintaining this position is by the use of switch points adjacent to the scale.

Binding between yoke and bearing plates or scale timbers may be caused by not having originally made sufficient clearance between the yoke and platform timbers, by platform timbers spreading slightly at the top or bottom, or by the platform shifting longitudinally on its bearings. This defect can be remedied by giving proper original clearance, and by tying the platform timbers securely at the top and bottom to prevent spreading.

The binding between the yoke and bearing plates may be caused by the platform timbers spreading at the bottom, or by the stretching of the links supporting the main levers on which the plates rest, allowing the plates to drop down so they will strike against the expanded portion of the base of the yokes. The remedy for this defect is to prevent the timbers from spreading and to keep the links the proper length. If the scale foundation or bearing stands are out of level, the platform will swing toward the low side and cause binding against the yokes. This can only be remedied by leveling up the stands.

Bearing feet or plates resting on or coming in contact with angle irons on frames is another very prevalent trouble with timber scales, and is generally caused by the bearing feet or plates crushing in the platform girders or stringers on the outer or back side, causing the nose of plates or bearing feet (to which are secured the plate tie bars) to slip downward and come in contact with the angle irons on the cross section frames. This condition might be caused also by the links supporting the main levers being too long, or by the knife pivots being badly worn, but a scale in this condition would be unfit for service.

For a remedy and a prevention of these defects it is suggested that when first placed on the platform girders or stringers, the front or inside edge of the plates or bearing feet should be dapped into the timber about ½ to ¾ in. This will tip the nose of the plate upward slightly and allow for considerable crushing in at the rear edge of the plate before the nose of plates will strike the angle irons. Where soft material is used for platform stringers it is often desirable to fit hardwood blocks or steel plates under the bearing feet or plates.

About the only cause for levers getting out of line and level is for the foundation to give way or for the timbers underneath the stands to become rotten or crushed. The only remedy is to ascertain the cause of the trouble, whether in timbers or foundation, and correct it by replacing inferior material.

There are two causes for dull bearings: wear and corrosion; and it is a question which of these is the greater factor. The greatest wear on pivots naturally comes on the main lever knife pivots, as they receive the first impact from the weight applied. We invariably find that the pivots in the levers constituting the end sections of the scale show the most wear. This condition can be remedied, if not entirely eliminated, by the use of a buffer rail, or a flexible easer rail to carry the wheels over the joint without impact.

The protection of dull knife edges from corrosion seems without solution, but a number of experiments are being conducted. However, if scale pits or vaults are properly drained and scales are frequently cleaned and irons painted, the trouble will be reduced to some extent.

Breakage of scale castings and bearings is caused generally by the parts being subjected to strain beyond their intended capacity. As a remedy, we suggest that scales be equipped with dead rails, and nothing but cars to be weighed be allowed to pass over the scales. All engines or other equipment having upon any axle or truck a concentrated weight greater than the actual capacity of the scale parts constituting a section, should not be allowed to pass over the scale.

It is highly essential that the scale mechanism should be inspected regularly to ensure that it is kept in condition to do its work properly and fairly. For the best results the mechanism should be inspected each day before being used. If there are two shifts of weighmen, each man, before going on duty, should go under the scale and examine all knife edges and bearings, and all points where binding may occur.

The frequency with which the scale inspector should visit the scale and make an examination and test, may be said to depend on the scale itself. The Glassport scale of the Pittsburgh & Lake Erie with its excellent design and installation and double daily inspection by weighmen, might have gone five years without other inspection and test if we judge by the results of tests. Some companies with very good installations have found it to their interest to put the test car on the track scales daily. It is perhaps safe to say that a track scale subjected to spot weighing should be inspected at least once a month by an expert, and it might be well to test it at the same time.

Testing seems to be quite general, contrary to some published statements, as but 28 roads (having a total of only 175,000 freight cars) report having no test car, while 57 roads (having 1,683,000 freight cars) report having such cars. Many of the roads which have no test car report having their scales tested with a test car of some weighing association or connecting road.

The proper weight of a test car for track scales seems an open question. All scale men seem to advise a car weighing one-fourth the capacity of the scale. As present equipment imposes a load equal to half the weight of car and load on each section in the process of weighing, and on the central sections in passing cars over the scale a load equal to two-thirds the car and load, it would seem the test car should approach one of these maximum amounts. This would make it from 75,000 to 106,000 lb.

The tests of track scales may be described as of three types. First, a daily test should be made by the weighmaster. Second: The beam test can be made by bringing the scale to a balance by moving the poise up to a balance from a lower weight, and then moving it to a higher weight, and bringing down to a balance and noting if they agree. Third: The platform test is made by having a known weight added after the scale is brought to a balance with the car on it. This may be done by a man stepping on the rail. The scale should show this change with a measure of accuracy.

RAILWAY CONSTRUCTION IN ARGENTINA.—It is reported that the Argentine government will soon invite tenders for taking over the Formosa-Embarcacion Railway, in the province of Salta. It has been said that this railway, supplemented by steamers on the Parana river, would be capable of dealing with all the traffic of the Oran Valley, which already exceeds 50,000 tons annually, and in addition, would open up large areas of valuable lands.

The Seasonal Distribution of Maintenance Work

A Study of the Reasons Promoting and the Results Accomplished by Revised Schedules on Several Roads

It is generally recognized that the existing practice of employing a large portion of the track forces for only a few months of each year is highly inefficient. At the same time this practice has been so universally followed since the early days of railway development that it cannot be changed to any great extent without a radical rearrangement of the entire program of maintenance work. This problem is, however, being given a great deal of attention on a number of roads, and several lines have already worked out and have in effect, revised schedules of track work. Several of these plans will be described in the following article:

The evils of the present system with its wide fluctuations in forces, have been most apparent during the past two years of pronounced labor shortage in all industries, and this condition has served to direct attention to the possibility of distributing the regular maintenance work over a longer period in order that the available forces may be utilized to the best advantage. The economies which are possible with the successful prosecution of such plans are very great. The expenditures for maintenance of way and structures on the railways of the United States for the year ending June 30, 1911, as reported by the Interstate Commerce Commission amounted to $366,025,262, or 18.87 per cent. of all expenses, of which amount $169,161,324, or 46 per cent. was paid to section foremen and other track employees.

EVILS OF OUR PRESENT SYSTEM

In general the practice of the roads is to reduce track forces to the minimum during the winter, to increase them slightly early in the spring and then to materially increase them about July 1. The forces automatically reduce themselves somewhat with the approach of the harvest season and they are further reduced to a winter basis in October or November. From the standpoint of the road this practice is bad because: it drives the better class of men into other industries where more permanent employment is secured, leaving only the inferior men, mentally and physically, for the railway; it means the almost continual employment of unskilled and inexperienced men with all the attendant evils; it subjects the roads to severe depletion of forces at harvest and cotton picking time, when men are most needed on the track; the roads are the worst sufferers in seasons of industrial expansion and acute labor shortage for many men accept railway employment only as a last resort; and it promotes inefficiency in the men themselves.

Because of the temporary character of our track work the ambitious and more efficient laborers remain in the railway service only until they can enter other industries where employment is relatively permanent and the rewards for extra efforts are greater. As a result the track forces are composed mainly of inefficient men who are unable to secure positions elsewhere, or of newly arrived immigrants unfamiliar with our customs and language as well as our work. Also, with the knowledge that they will probably be laid off in a few weeks, the laborers are more readily attracted to the harvest field each season, whereas, if they had permanent employment on the railroad, temporary work of this nature, even though paying 50 per cent. more, would probably not attract them. Under present conditions the harvest fields make serious inroads on our forces and track work suffers at the time it can be done to best advantage.

The lack of sufficient labor at one season and the surplus at another, indicate an unequal distribution and the creation of waste. The presence of several hundred thousand idle men in the large labor centers at this season of the year results in an economic loss in actual labor itself. Many of these men are willing to work if the opportunity is offered and most of the others have been trained in their habits of idleness by this system itself. If by some means the surplus labor could be employed on productive work during the winter, the deficiency during the summer would be greatly reduced. In view of recent periods of labor shortage, it is evident that it is rapidly becoming necessary to conserve our labor supply in order that the necessary work can be completed. Even though this labor may cost slightly more in the measure of work done during the winter than when done under the best conditions in the summer, it may be economical when considered from the standpoint that it may be impossible to secure sufficient men at any price to do this work at the more favorable season, and that the forces employed during the winter are engaged on productive work.

From the standpoint of the men the present system is bad because it automatically drives them into factories and other industries where the tenure of employment is greater, although the work may be less healthy, and it creates inefficient habits and a lack of responsibility which results in many becoming public wards during the winter. Any influence which encourages men to leave active outdoor work for more or less routine factory employment is detrimental to their physical welfare. More serious, however, is the problem of caring for these men during periods of enforced idleness. During the past winter probably over 500,000 unemployed men have been gathered into the large labor centers. The problem of caring for these men is a big one, costing large sums of money and creating a public menace. The housing of these men also tends to make them more and more subject to charity and thereby decreases their efficiency from year to year.

The difficulties confronting the employment of uniform forces throughout the year are: the seasonal character of a large portion of the maintenance work; the necessity of making the expenditures conform closely to revenues on many roads without sufficient financial reserve to permit advancing large sums for maintenance; the arbitrary practice of other roads of making expenditures for maintenance fluctuate from month to month with earnings in order to maintain a uniform operating ratio, even though they may be able to advance funds for these expenditures from accumulated surplus, for a few months; the termination of the fiscal year at June 30, instead of December 31; and long acquired habits and customs of doing work.

Certain classes of work can only be done advantageously at certain seasons of the year and it would be unwise, if not impossible, to do such work at other periods. Ballasting and surfacing, for instance, are distinctively summer problems. On the other hand much work now crowded into the summer months can be done almost or equally as well during other seasons, thus reducing both the crest and sag of the labor curve.

Of equal importance with the distribution of work throughout the entire year is the distribution of the summer work throughout the entire season. At present due to financial considerations much work which should be done during the spring is customarily postponed until the early summer. At other times forces are arbitrarily reduced in order to make a favorable showing with some preceding month or year. As an illustration one of the strongest roads laid off all track forces except the foremen the last two weeks in September to comply with an order requiring maintenance expenditures to show a certain per cent. decrease below those of the previous year, even though all rail released the previous year had been credited in this month, making the charges for that month unusually low. To secure the most efficient organization the maintenance forces should be retained uniformly throughout the year. This is of course not entirely practical on all roads, but many of the more pronounced fluctuations can be eliminated.

AGENCIES PROMOTING REVISION OF PRESENT PRACTICE

The most important forces tending to revise the present practice are: the necessity for securing and holding more efficient

laborers in the track department in order to at least partially arrest the continually increasing maintenance charges; the present frequent inability to secure laborers of any kind; the demand for increased efficiency in the maintenance as in all other departments of railway operation; and the present lack of material in the ranks from which to recruit future section foremen.

These forces have not been equally active on all roads. In some places local labor conditions have been less severe than in others. The financial problems affect some roads more seriously than others. Also, efficiency studies have been more generally made on certain roads than on others, as the result of which present conditions in the track department have been more carefully studied for the purpose of devising improvements. Therefore progress in the distribution of maintenance work throughout the entire year or season has been more pronounced on certain roads. The developments on the Long Island; the Lehigh Valley; the Central Railroad of New Jersey; the Philadelphia & Reading and other roads will be described below:

THE LONG ISLAND PRACTICE

The Long Island Railroad has made the most radical departure from the general practice in that it has organized its work and forces upon a uniform basis throughout the entire year. This road carries a very heavy passenger traffic in the summer and the period of lightest business is in the winter. As the entire mileage is on Long Island with a subgrade of sand well drained, the difficulties with frost and heaving of tracks are few. During the winter of 1912-13, it was possible to put in ties and cinder and gravel ballast up to the end of January. As a result of these traffic and climatic conditions it was decided to do more track work during the winter, instead of crowding it all into the period of heaviest traffic.

Accordingly, on May 16, 1913, the track forces were entirely reorganized and the work was placed upon a yearly rather than a seasonal basis. The section gangs were reorganized with five men and a foreman employed throughout the year, whereas with the old method three or four men were employed during the winter and as many as ten men during the summer. The rate of pay for laborers was raised from 15 cents per hour to 17.5 cents, while sub-foremen were paid 18 cents per hour. The foremen were raised $5 to $15 per month. As men are employed they are informed that they will be retained at this same rate throughout the year with the exception that they are cut to nine hours in the winter. Each man is also given the assurance that he will be employed as long as his work is satisfactory. The foremen were given to understand that they would be held strictly accountable for the progress of the work on their sections and they were instructed to replace any inferior or incompetent men with more efficient laborers which the increased rate of pay made it possible to secure. Although 90 per cent. of the foremen and practically all of the laborers are Italian, making it more than usually difficult to remove the influences of relationship, over 50 per cent. of the men, primarily old men, boys and men otherwise incompetent, were replaced with more efficient laborers.

As the work is now organized, all forces are employed on productive work throughout the year. Also the amount of extra gang work has been very materially reduced and the section foremen regularly handle almost all the routine work on their respective sections. In previous years it was the practice to rush all ties into the track with section and extra gangs early in the spring before the heavy passenger business began. As a result they were not always properly put in and the track required increased attention later. The ties were also distributed by extra gangs with work trains. Under the new system the ties are distributed and put in by the regular section gangs as they require renewal at any time throughout the year. Thus, on February 1, nearly one-half of the 200,000 ties allotted for the present fiscal year were in the track, and it is maintained in a practically uniform condition throughout the year. Rail is relaid in the same way in small sections as it becomes necessary. With the exception of five gangs of ten men each employed on heavy improvement work and the construction of new industrial spurs, all extra gangs have been abolished. While these five gangs are dependent upon the amount of new work done, it is expected that the men will be employed permanently.

When the plan was inaugurated instructions were issued that there was to be no increase in the pay roll of this department. The increases in wages were therefore made up by the reduction in the number of men employed. With no increased expenditure it is estimated that so far there has been an increase in efficiency of at least 35 per cent. One measure of this is the fact that 1.6 miles of track is maintained per man. Further, without any increase in force 220,000 ties were put in during 1913 as compared with 160,000 in the previous year, an increase of 37.5 per cent. Also, although a large amount of fence will have to be rebuilt in the near future, it is planned for the section forces to take this work over from the bridge and building department so that the work can be done more uniformly, especially with regard to small repairs.

Among other advantages are the fact that only experienced men are employed, greatly increasing their efficiency as well as reducing the number of personal injuries as the men learn to take care of themselves. This latter feature is especially important on this road with a large mileage of third rail electric lines. With the knowledge that their positions are permanent and dependent only upon satisfactory performance of their work, the men are desirous of holding their positions and considerable numbers are securing homes out along the line. There is now a long list of applications for positions on the different sections. There is also sufficient material in the ranks to fill vacancies among the section foremen as they occur. Also, with five men in the gangs during the winter time there is a sufficient force to do productive work, whereas, with the customary force of two or three men, practically the only work accomplished was the patrol of the track and the sweeping of snow from the frogs and switches.

WINTER WORK ON THE LEHIGH VALLEY

The Lehigh Valley has attacked this problem in another way. On this road all rail has been laid during the winter for the past two years, although in other details the order of work is the same as commonly followed on other roads. The results of this practice were described in the *Railway Age Gazette* of February 20, from the standpoint of the rail laying operation itself. We will refer to it here only from the standpoint of its effect upon the distribution of labor throughout the year.

During the winter of 1912-13, 306.21 miles of 100-lb. and 110-lb. rail was laid between November 1 and April 30. Of 166.63 miles of rail allotted for renewal work this year, 86.72 miles was laid up to February 1. Rail is laid on both main and branch lines at this season. Fully 50 per cent. of the rail released on main lines is immediately relaid on branch lines and the remainder is laid in yard and side tracks. One or two steel gangs are diverted from surfacing work when the track freezes up each fall and they work in conjunction with the section gangs. In laying this rail reinforced angle bars without depending flanges are used and the track is thoroughly anchored at all times.

Rail renewal is ordinarily one of the heaviest classes of maintenance work. By this method it is completed during the dull season, employing men who would otherwise be laid off during the winter and rendering unnecessary the working of this number of men in addition to those which will be employed on other work during the summer. It is a common experience that it is not difficult to retain men during the summer who are held through the winter. The problem is to secure sufficient men for the two or three months' temporary work. By laying rail during the winter time the Lehigh Valley has retained experienced men in its gangs and has suffered no scarcity of labor during the past two seasons of severe labor shortage, although

no attempt has been made to increase wages above the prevailing market rate and the men have been reduced to nine hours time during the winter.

While the rail laying alone has not been sufficient to require the employment of as many men as are worked during the summer, the accompanying curve showing the percentage of the total force employed each month during the year from October 1, 1912, to September 30, 1913, illustrates the extent to which

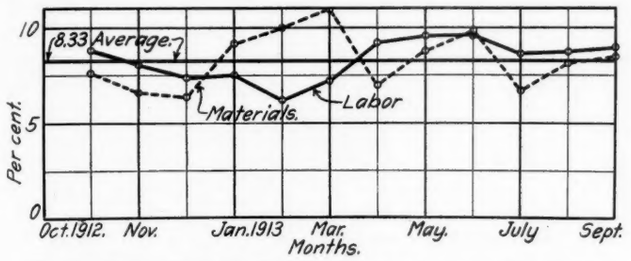


Fig. 1—Curve Showing Per Cent of Total Annual Force Employed and Material Used by Months on the Lehigh Valley

a uniform force has been maintained. From this curve it will be noted that the minimum force was employed in February, when 6.2 per cent. of the total force for the year was employed as compared with 9.6 per cent. in May and June. A similar curve showing the percentage of material charged out in the various months, reveals the interesting fact that the maximum charges were made in March due to the laying of 90 miles of rail in this month.

In addition to retaining a large number of experienced men it has been necessary to secure only a small number of men from the labor agencies, as the gangs have been found to fill up readily. Many men sent out by the agents have also remained permanently on the road and have located there with their families. Beside the advantages just enumerated more regular deliveries of rails can be secured from the mills and the entire forces are engaged on productive work during the winter.

THE CENTRAL RAILROAD OF NEW JERSEY PLAN

While working under no such definite schedules as the Long Island, the Central Railroad of New Jersey endeavors to retain nearly all of its summer forces throughout the winter. Practically no reduction is made in either the number or the hours of work of the section forces. Also because of the large amount of construction work under way on this road during the last two years, it has been necessary to retain most of the extra gangs as well. Where the latter forces have been reduced, the best men in each gang are retained and the organization of the gang has been maintained, no entire gangs being laid off.

In addition to the routine maintenance work these forces are employed during the winter primarily in laying new rail and in making the necessary renewals or repairs to frogs and switches. All new rail on which delivery can be secured from the mills is laid during the winter; although differing from the practice of the Lehigh Valley, the ties are respaced as soon as the frost leaves the ground in the spring. As this road passes through a very busy industrial territory, the maintenance of the frogs and switches forms a very large part of the track work. There are over 900 switches in the Jersey City terminals alone, and the average main line section includes 35 to 40 turnouts. With the heavy traffic passing over this road, these frogs and switches require frequent heavy repairs or renewals. As far as possible this work is done during the winter time. In this way two of the heaviest classes of maintenance work are completed during the winter, leaving the forces free to devote their time to other work during the summer.

PRACTICE ON THE READING

The maintenance practice on the Reading is largely similar to that on the Central Railroad of New Jersey. Only about 10 to 15 per cent. increase is made in the section forces during the summer months, while most of the extra gangs are held throughout the year. As fast as the rail can be secured it is laid during the winter, although here again the ties are spaced in the spring. About 24,000 tons of rail is being laid on this road this winter. New rail on main lines is laid by the regular section forces assisted by extra gangs working under the direction of the resident section foremen. Second-hand rail for branch lines is regularly laid by the section forces without the aid of outside gangs. The extra gangs employed in rail laying on the main line during the winter months are transferred to ballasting and other heavy work during the summer.

STARTING EARLY IN THE SPRING.

In all the plans described above the aim has been to do as much work as possible during the winter in order to equalize the forces employed throughout the year as far as possible. Other roads are attacking this problem in a different manner. While reducing their forces to the minimum during the winter they start work as early as possible in the spring and rush it during the early months so that a large portion of the rail laying, ballasting and other heavy work is completed before other roads enter the market for men.

The experience of one large Western road which has probably developed this plan with the greatest success will be described. For the past two years especially, the section gangs have been supplied with their full quota of men as early in the spring as weather conditions would permit track work to be done. At the same time, extra gangs were organized and began putting in rail and ballast on the different divisions. The accompanying curves which are prepared from data covering 4,500 miles of line, show the extent to which both the section and extra gang forces are increased early in the spring. Thus the section forces were increased last spring from a winter enrollment of 2,894 men to 5,822 in April, the maximum for the season. From this point there was a steady decrease throughout the remainder of the season. In the same way the extra

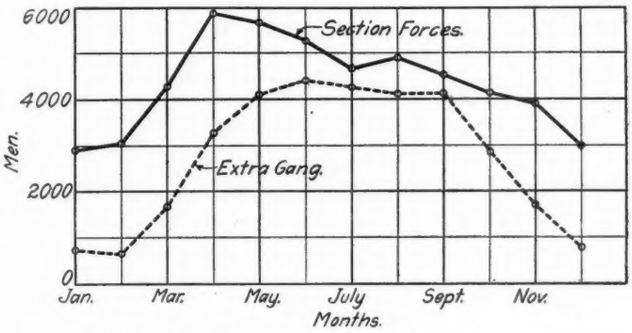


Fig. 2—Section and Extra Gang Forces Employed on a Large Western Road by Months in 1913

gangs were increased from a total of 775 men in January to 3,327 in April and to a maximum of 4,425 men in June. The latter part of this curve is not typical of general conditions as 105 miles of second and third tracks were built last year, track laying and ballasting of which held a large number of men late in the fall. Under normal conditions these forces would have been more rapidly reduced after July 1.

As a result of this plan it is instructive to note that although 228 miles of 90-lb. and 100-lb. rail was laid, practically all of this was in place before July 1. The progress with tie renewals is equally favorable. All ties are renewed by section gangs and on July 1 the progress reports from the different divisions show that an average of 72 per cent. of the ties were in with a maximum of 86 per cent. on one division and a minimum of 58 per cent. on another. Even with these high figures, this

work was delayed on certain divisions by some difficulty in securing delivery of ties.

By employing men early in the season, a large saving was effected by the paying of lower rates than prevailed later in the summer. The rate for section laborers was established on January 1 at $0.15 per hour. This was raised to $0.16 on March 1 and maintained at this figure throughout the season. The rate for extra gang labor was established at $0.16 per hour on January 1, was raised to $0.17 on March 1, and to $0.175 on March 15. This rate was reduced to $0.165 on October 13, and to $0.16 on December 9. When it is understood that other roads in the same vicinity were paying $0.20 per hour for men for some time during the height of the season, the saving in this one item alone can be realized. As would be expected, the higher rate paid on the other lines attracted many men from this road, but as the larger portion of this work was completed, it could well afford to lose them.

Several other important advantages have been realized. No

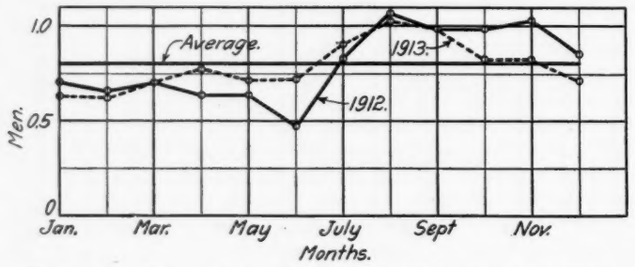


Fig. 3—Distribution of Men Per Mile of Main Track in 1912 and 1913 on Typical Road

difficulty was experienced in keeping the gangs full in April and May when the work was at its height, as the men remained longer in the gangs and vacancies were readily filled. More work was secured from the men in the spring than in the hot summer months and the output per day was undoubtedly considerably greater. The desertion to the harvest fields did not demoralize the forces to the extent that it did on other roads because at this season there was less work remaining to be done. The track was maintained in better condition throughout the summer and at less expense as the defects in line and surface which developed during the winter were promptly overcome in the spring and were not allowed to become worse.

COMMON PRACTICE ON A TYPICAL ROAD

In contrast with the different methods just described the practice common to a large measure on most roads will be

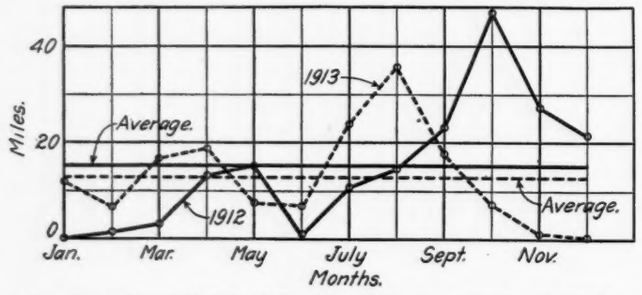


Fig. 4—Miles of Rail Laid Per Month During 1912 and 1913 on Typical Road

given below. While these figures are taken from the actual records of one prominent road, they are very largely typical of conditions on many lines.

On this road the expenditures for maintenance are influenced very materially by the fiscal year, although this effect is more pronounced in the routine repair work and rail renewal than in ballasting or addition and betterment work. In the accompanying curve showing the number of men per mile of main track it will be noticed that while the fluctuations in 1912 were more pronounced than in 1913 the same general conditions prevail. Thus there was no increase over the winter basis until July 1, and in 1912 there was an actual decrease of 34 per cent. in June. Immediately after the close of the fiscal year there was a pronounced increase so that the average force for the six months after July 1 was almost 50 per cent. greater than that for the preceding period. The seriously detrimental effect

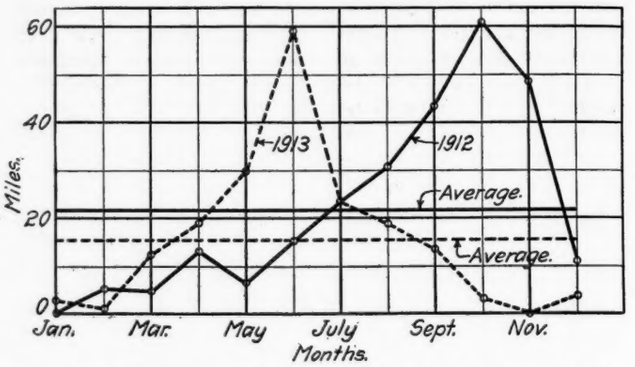


Fig. 5—Miles of Ballast Put in by Months During 1912 and 1913 on Typical Road

of such a fluctuation in forces is evident, although this practice is found on many roads.

The work done is, of course, proportional to the force employed. Looking over the records of rail renewals, for instance, we find that in 1912, 31.95 miles of rail was laid in the six months ending June 30, as compared with 145.47 miles in the following six months. While not so marked in 1913, the curve showed the same general conditions. In this connection it should be noticed that in 1912 the largest amount of rail was laid in October, and in 1913, in August. The same general condition is found in the record of ballast put in. In 1912, 45.65 miles of track was ballasted before June 30, and 217.05 miles between July 1 and December 31. However, in the following

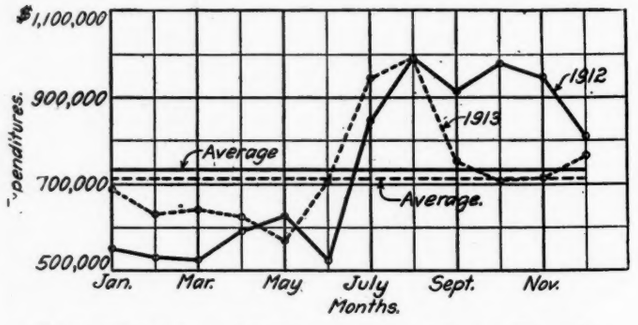


Fig. 6—Distribution of Maintenance Expenditures Charged to Operation in 1912 and 1913 on Typical Road

year the conditions were reversed, as shown on the curve. The same general tendencies are also shown in the curve of expenditures.

The most important disadvantages of this system are self-evident. The normal season for heavy track repairs is from early spring till fall. However, in spite of the weakened condition in which the track is left in the spring, only the minimum amount of work was done during April, May and June. The result is that not only are three of the best months for track work lost, but the amount of labor required in July to bring the track up to its proper condition is much greater than in April, increasing the expense materially.

Again, when rail is laid late in the season, it is necessary to employ practically all the forces on this work. As a result there is not a sufficient force to surface up the track before it freezes. With the small forces employed in the spring, it is

again impossible to do any surfacing. The rail therefore suffers excessive wear before it is properly protected and a considerable portion of the benefit normally expected from the heavier rail is lost.

However the labor problem is the most serious. Coming into the market about July 1, the road finds that the best men have already been secured by other roads or industries. Frequently there are not a sufficient number of men remaining to supply the demand and the rate rises accordingly, as it did last year, when roads paid 20 cents per hour. When these conditions prevail the men know that they possess the advantage and they become more independent and less efficient, going from one road to another on slight provocation. At the same time they are employed during the hottest months of the year when it is impossible to secure the best results from any class of men. When gangs are organized in July the work is hardly started before the harvest season arrives and they are depleted. Serious as each disadvantage is by itself, when combined they very materially decrease the results secured from a given expenditure.

SUGGESTED REMEDIES.

The question may properly be asked: What is the remedy for these conditions? The first and most effective remedy is to change the fiscal year to end with the calendar year, instead of on June 30, as at present. Ending in the middle of the natural working season on the track, the fiscal year is now the greatest deterrent factor to economical maintenance. On some roads the financial conditions are such that a so-called "paper showing" is considered necessary, even if uneconomical, to sustain the credit of the road in the mind of the investing public. On other roads which are strong financially the officers in direct charge of the operation of the property report to the bankers who frequently are interested in the roads only as investors, and who look for their regular and immediate returns rather than for ultimate economy. Under these conditions the officers are forced to maintain a proper showing, even at the expense of the properties, to maintain their tenure of office. The limits of the present fiscal year are purely arbitrary and are primarily for accounting purposes only. Indeed, some roads, including the Pennsylvania system and the New York Central Lines, now operate under the calendar year, except in so far as reports to the Interstate Commerce Commission are concerned.

Opposition to such a change would undoubtedly arise primarily from the accounting and financial departments, for some adjustment and rearrangement of work would necessarily have to be made. Several years ago the Interstate Commerce Commission suggested that the fiscal year be changed to correspond with the calendar year, but largely because of the railway inertia and lack of united consideration of the subject, nothing came of the suggestion. It would seem that the American Railway Engineering Association, whose membership has the best opportunity to observe the detrimental effects of the present system might well present this subject to the American Railway Association, emphasizing its importance. The American Railway Association, in conjunction with the Interstate Commerce Commission, could then carefully consider the subject from the standpoint of all departments, and arrive at a satisfactory conclusion which would be accepted by such a large majority of the roads as to insure its universal adoption.

The progress made by the roads referred to in this article in the more economical arrangement of their maintenance work indicates ways in which the different roads themselves can apply the remedies to their own particular problems. The extent and the manner in which work can be distributed throughout the year or season depend, in large measure, upon the climatic and other local conditions on the individual roads. A road in Montana or Canada, for instance, could not renew ties all winter as the Long Island does. However, forces which are now generally laid off in the fall could be very profitably employed in this and similar work in the large area of the southern states. The roads in the north can at least adopt a plan similar to that of the western road referred to, of starting work early in the spring, and distributing it over six, instead of three months. It might be said that if all roads came into the market for men early, as this road does, some of the advantages gained by this road would be lost. This would be true to a limited extent only. Granted that all the roads started their work at the same time this one line does, all this work would be distributed over six months, instead of three, the number of men required per month would be correspondingly less, and the shortage of labor would be alleviated, if not entirely eliminated.

A careful study of the distribution of labor in which all prejudices are laid aside, will show a considerable variety of manners in which work can be more uniformly distributed, and the forces employed to better advantage. The ultimate results of such studies will be reflected primarily in more economical maintenance, and also in the conservation of our labor supply.

EFFECT OF 1913 DROUGHT UPON RAILWAYS OF SOUTHWEST

By L. C. Lawton

Division Engineer, Atchison, Topeka & Santa Fe, Newton, Kan.

The four months from May 14 to the middle of September, 1913, will be long remembered in that part of the central west between Iowa and Texas as covering the great drought. The precipitation in parts of this territory was not over 2 in. and nowhere did it add to the supply of available water, other than where it fell on the surface of existing ponds. The last six weeks of the summer were unusually hot, with very low humidity and many hot south winds, all tending towards the greatest possible evaporation. Large streams which before had never ceased to flow were dry except for occasional holes. Many springs which have supplied railway water stations for 30 years, were dry for 60 days, while other springs, although flowing with decreased supply, still proved that they were to be depended upon. The same is true of wells, certain ones failing early in the season while others maintained a moderate supply throughout, and a few showed no decrease. Information of this kind gathered by cities, towns and railroads will be of inestimable value in future developments.

Central Kansas felt the unusual drought as much as any locality, and the experiences met with here may be taken as an example of the whole territory. The Arkansas river valley covers a considerable portion of this locality and as in other parts of the state retained very little surface water, although the under flow below the river bed was very little affected. The only difficulty was with drilled wells where the unusual demand for water produced a flow towards the casing which carried the quicksand in the gravel, into the points or openings in the casing, shutting off the supply. Many of these wells were enlarged either by using perforated concrete casing 24 in. or more in diameter, or by digging wells 24 to 30 ft. across. The latter are much to be preferred for railroad use, as they cost nothing to maintain, and are not very expensive or hard to construct. One well sunk near Wichita during this period was 24 ft. in diameter and 30 ft. deep, extending 17 ft. into water-bearing sand and gravel. A stone wall was built from the top on a wooden shoe and sunk as the excavation proceeded. The material was removed by a derrick with drop bottom boxes, which were filled by shovelers. A dipper could have been used to good advantage, though some shovel work would have been necessary to keep the walls vertical. The water was handled by two, and later by three, 3 in. pulsometer pumps, until at the last, although 1,000,000 gal. were being pumped daily, the water gained so fast that the work had to be stopped there. This was done at a time when the city of Wichita was having considerable difficulty in securing a supply. The water from this well was well adapted for domestic use and yielded to easy treatment for boiler purposes.

A similar well on the same stream at Mulvane supplied not

only a large station there, but water was hauled from this point to a large terminal nearby, although a battery of city wells driven within 100 yds up stream failed entirely. Outside of this underflow the wells driven in shallow water almost without exception failed to afford a complete supply for railroad use. Even adjacent to such streams as the Cottonwood and Republican rivers the water strata is not a continuous sheet, but seems to be divided into small reservoirs which are gradually drained. This was especially noted along the Cottonwood river, where wells near a mill dam were exhausted while there was still plenty of water in the river above the water level in the well. Apparently the size or style of well will not greatly affect the supply of water in this locality.

Other sources of railroad and municipal water supply are the larger streams which do not cease flowing and those that flow most of the year where a small reservoir formed by a masonry or crib dam will carry over the dry periods. For several reasons these are not very satisfactory. From its long contact with the soil the water is very hard and is expensive to treat for boiler use. The dams in the smaller streams are quickly filled with silt and the water supply becomes inadequate, while in the small rivers the water is collected in mill ponds whose owners require a heavy toll for its use. So arbitrary have some of these mill owners become that one tried unsuccessfully through the courts to stop the taking of water by a railroad from a stream fed by nearby springs, because this water might have flowed over his dam 14 miles below and afforded him power. When we consider that the case was won only by proving that this water would have been lost by evaporation and seepage before reaching him, it is apparent that other forms of water supply should be looked for.

The building of large reservoirs had hardly progressed far enough in this part of the country to have any great influence upon the water supply, but this year brought out the good and bad points of the different types. A popular demand for ponds or small reservoirs was created by the papers until it appeared that a day would be set aside throughout the state to build them. Just why these were to be built or what purpose they were to serve would be difficult to determine after such a season. Few, if any, would be over 6 ft. deep or would be provided with adequate spillways to prevent the embankment from going out. It was unfortunate that no record of evaporation was kept, but by comparison there is little doubt that 60 or 70 in. was evaporated from the surface of ponds in the year ending with September last, and that 42 to 48 in. of this was in the four months when the rainfall was not that many inches and the runoff in the streams nothing. Thus we see that in the average pond the evaporation would take the entire supply without any loss by seepage or use by cattle. The same thing is true on a larger scale with railroads or towns who build long low embankments which may store a large amount of water, but which also has a very large surface. One of these reservoirs covers 70 acres with a maximum depth of 12 or 14 ft. and stores 100,000,000 gal., but 60,000,000 gal. of this is in the upper 4 ft., which, if the reservoir had been full at the beginning of the season, would have been a total loss last summer. At least 10 per cent. more would have been lost from seepage and the remaining 30,000,000 gal. would have provided only a 60 days' supply for a large terminal. On the other hand, a reservoir 10 acres in extent and 60 ft. deep would have held the same amount and would have lost but 12,000,000 gal. from evaporation, not over this amount from seepage and would have retained a five months' supply for the same terminal. In a country of this kind it is not always possible to secure a site where one can impound 60 ft. of water, but if reservoirs are to be built either large or small, they must be of this general character. When such a site can be found which will produce a gravity flow, the first cost is a small factor, as such water does not require treating, especially when from a small drainage area. This expense is much more than the pumping when we consider that two or three tons of chemical per day are sometimes handled in the large stations using river water.

A line north and south through central Kansas may be considered the dividing line between the reservoir type of water supply in the East and the deep well in the West. The deep well has proved a success in the extreme western part of the state even in irrigation, and wells from 60 to 300 ft. deep are providing almost inexhaustible supplies of water.

The railroads do not expect another such a dry season during the coming year, as the rains since September have filled the streams, the reservoirs and the earth itself to a greater extent than for several years. By the latter part of August the ground everywhere was filled with great cracks extending many feet below the surface. An outsider can only begin to realize how dry everything was when fence posts accidentally set afire burned down to the very bottom of the hole. When the easy rains of September and November came, these cracks absorbed all the precipitation for days, and it seemed as though the streams and ponds would never fill up. This has naturally put the country in good shape to stand another dry year should we be so unfortunate as to have one. Aside from this condition the roads will not be much better prepared next year to withstand another drought, as it takes time and much planning to bring about methods of permanent relief.

Several plans are being worked out by at least two of the roads in this area. One plan contemplates a number of deep wells with a discharge line several miles long, which will care for one point to which water was hauled. Another provides for a 140,000,000 gal. deep reservoir with a gravity line three miles long, at a cost of $60,000, which will relieve a shortage and eliminate heavy treatment. At still another point the water from a large spring may be brought by gravity to a cistern and pumped into the tank, thereby saving in daily treating much more than the interest on the investment. Should this work be carried out, it will not be completed in time to care for the coming season, and with the poor business caused by failure of the crops, the necessary money is not likely to be forthcoming this year. However, it is only a question of time until it will be necessary to carry out these and other plans for permanent water supply.

ORGANIZATION FOR SNOW REMOVAL

Early each fall detailed instructions regarding the removal of snow and measures to be taken to keep the tracks in service during severe storms are issued by the general superintendent of the Long Island. In these instructions, which are prepared particularly for the maintenance of way and operating departments, the places are given where all special material such as snow plows may be found. Each supervisor and other officer as well as each gang is assigned to a certain place and at the beginning of a storm, each man or gang does the work allotted to him. The engineer maintenance of way and his assistants remain in their respective offices directing the work and making such changes in the program as may be necessary to meet local conditions. In this way it is not necessary to organize forces and hunt up material after a storm arrives, causing delay and more or less confusion in beginning the work, but each gang takes up its assigned task as a matter of routine duty.

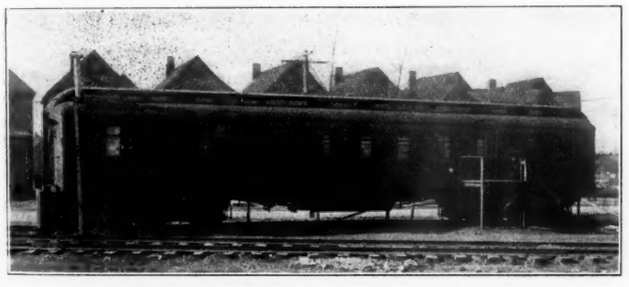
ITALIAN RAILWAY ENGINEERS OFFER AWARD FOR AUTOMATIC HOSE CONNECTOR.—The National Association of Italian Railway Engineers, recognizing the need for an automatic coupling or connecting device for the brake and steam pipes of corridor trains, has decided to offer a gold medal and a prize of $1,000 for such an apparatus, and at the same time, a gold medal and $600 for any non-automatic apparatus for the same purpose which may be approved by them.

Organizing for Important Track Elevation Work

Rock Island Is Handling Heavy Construction With Company Forces After Careful Preliminary Studies

The Chicago, Rock Island & Pacific is actively engaged in elevating portions of its main, branch and suburban lines near the southwest limits of Chicago, including the separation of grades at its crossing with the Western Indiana near Seventy-ninth street. The problem involves many special features and the method of organizing and handling the work is somewhat unusual and interesting. The limits of the separation extend from Seventy-second to Eighty-third streets, although the track elevation covered by the present ordinance extends to Ninetieth street, with run-offs on the South Chicago and suburban branches. The Rock Island is already elevated from the La Salle street station to Seventy-sixth street, but in order to make the necessary raise for the grade separation it will be necessary to go back to Seventy-second street and raise the grade approximately 15 ft. higher than it is at present at Seventy-sixth street.

The Rock Island now has three, and the Western Indiana four main tracks at the crossing and it is proposed to provide five main tracks for the Rock Island and ten for the Western Indiana. The latter company provides the entrance to Chicago for the Chesapeake & Ohio; the Monon; the Wabash; the Erie; the Chicago & Eastern Illinois, and the Western Indiana and Belt Railways, while the Rock Island carries the



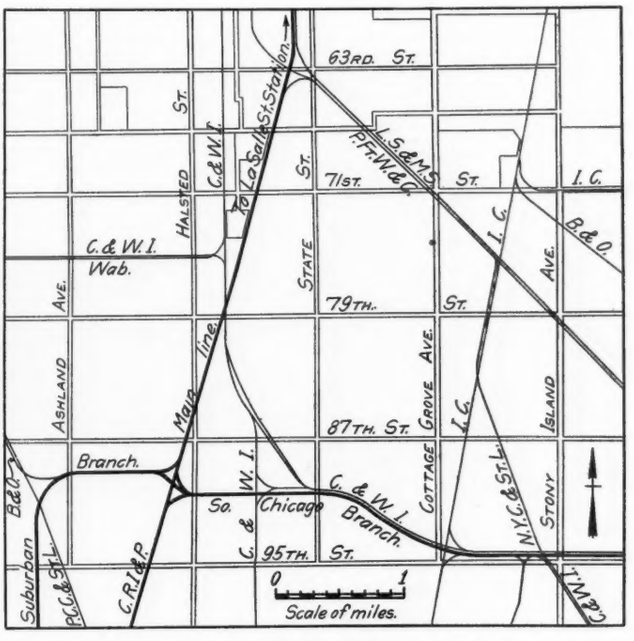
Converted Mail Car Used for Field Construction Office

detour trains of the Nickel Plate and some local suburban trains of the Lake Shore in addition to its own traffic. The proposed crossing is also in the direct route to the new Clearing yard.

The Rock Island is to be carried over the Western Indiana at Seventy-ninth street, while the Western Indiana tracks in turn will cross above the street. This will involve some complicated construction in this vicinity on account of the necessity of caring for the work without delay to traffic on the various roads, the train movements aggregating about 500 in 24 hours. Additional work covering the entire South Chicago line, as well as the suburban line to Beverly Hills, is also under ordinance and it is proposed to continue this work in regular order as fast as one section is completed, which will require about seven or eight years. On account of the magnitude of the problem and the large amount involved, careful consideration has been given to the method of handling the work. It was finally decided to place it in charge of the engineering department, with a special organization, and to do the work with company forces except in cases involving special features where, if found desirable, such work will be contracted.

DESIGN OF STRUCTURES AND PLANT

Considerable preliminary work was done before the actual construction started, the purpose being to segregate in every way the heavy regular traffic from the construction work, so as to minimize interference with the large number of trains. Considerable study and investigation was also made by the engineering department of the practices and results secured on other roads, and a comprehensive study of track elevation work has been made in Chicago and other cities. Special attention was given to the design and construction of the walls and subways on account of the great height which will be required at grade separation points, the walls in the vicinity of the Western Indiana crossing being about 40 ft. high. Rock was found to lie so far beneath the surface that exhaustive soil tests became necessary in order to determine the character and safe load of the overlying strata; this also included comparative studies of the costs of the different types of foundations, including the use of wooden and concrete piles. It was finally decided to place the excessively high walls on concrete piles, and the Raymond type has been selected. This portion of the work is being done by the



Portion of the Rock Island Lines in Chicago

Raymond Concrete Pile Company, approximately 250,000 lineal ft. of piling being required.

On account of the large amount of concrete construction involved in this work, a comprehensive study has also been made of various methods of mixing and handling this material to facilitate the progress of the work and reduce the unit price of the concrete. Numerous plants for similar service were inspected in various parts of the country and the ideas of manufacturers and contractors using conveying machinery were obtained, with the result that two plants equipped with belt conveyors were finally designed by the engineering department, and installed to handle the materials, with provision for dumping the sand, stone and cement directly into the charging hoppers over the mixers. The use of bulk cement has also been considered as offering advantages, and it is probable that it will be used to more or less extent during the year. A plant that would be easily portable was essential, which resulted in the adoption of a car outfit. One plant is being used for foundations, etc., where no elevation of the concrete is required, and one for walls, etc., where the mixed

material is elevated. These plants are equipped respectively with a one-yard Marsh-Capron and a one-yard Smith mixer, representing the tilting and non-tilting type of mixers.

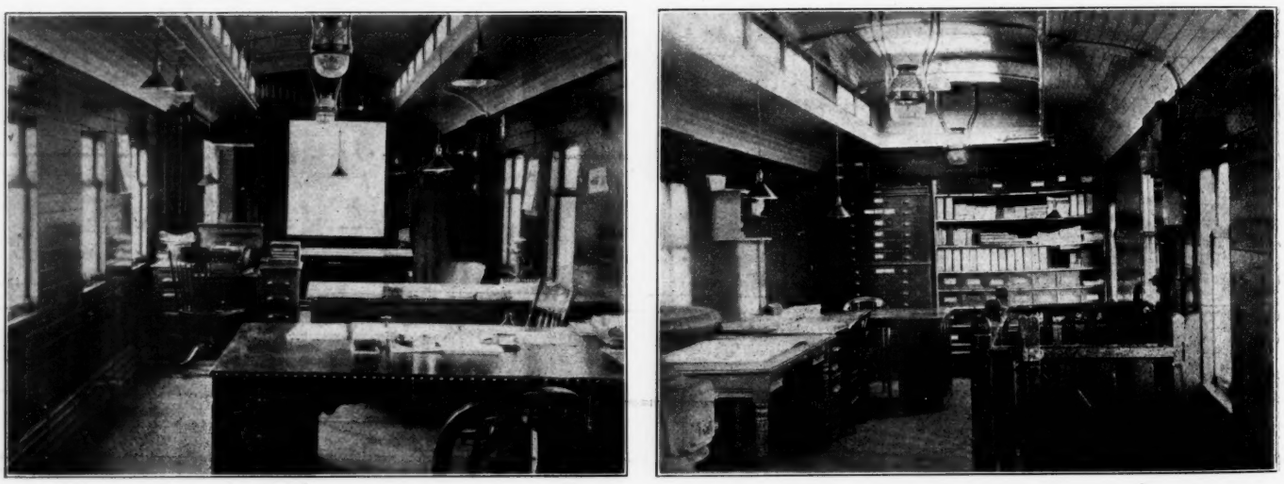
Each plant is mounted on three 40-ft. steel underframe flat cars. The first car carries the mixer and the boiler and engine which supply the power for the mixer, hoist and belt conveyor, etc., as well as a 63-ft. steel distributing tower built in 12-ft. sections; the next two cars are for the storage of stone and sand. These two cars, called bin cars, each have two storage bins holding about 40 yd. of sand and stone and are arranged in such a manner as to permit the materials to fall directly into measuring boxes, after which they are dumped on the belt which runs immediately underneath the boxes and just above the floors of the cars. This belt is carried on conveyors over the top of the boiler and engine on the forward car, directly to the charging hopper. The material cars are placed on a construction trestle, built primarily for raising the tracks to the new grade; the loaded cars of sand and stone are run up on the trestle and stopped opposite the respective bin cars on the construction track below. Two levers are located at each hopper, one controlling the discharge from the storage bin and the other from the hopper, so that one man can fill the measuring hopper from the bin and then drop the material on the belt without changing his position. Thirteen men are required to operate each plant when no shoveling from the material cars is necessary. The output of concrete has frequently reached 60 yd. an hour with each of these plants.

It is intended to waterproof the back of the walls and abutments and several sample types of waterproofing have been applied by various manufacturers to test sections of retaining wall, the engineers keeping full record of the amount of material, time and method of application, etc., to arrive at the unit cost. These test sections adjoin each other, it being the intention later to go over the matter thoroughly to ascertain which seems to have given the best result. Meanwhile, no filling is being placed against the retaining wall section which has been held for the test.

Reinforced concrete slabs and columns will be used for the street bridges. These are being cast in a very complete and well arranged slab yard adjacent to the supply yard near Eighty-ninth street. Reinforcing steel has been purchased in mill lengths and bar racks have been built along the supply track approaching the slab yard for the storing of this material. These bars are laid on the rack according to size so that the desired reinforcing can be secured with facility. A careful selection was made with the view of reducing as far as practicable the number of sizes to be used. A power plant with shears and bender has been installed adjacent to the racks for cutting and bending the bars. Sand and stone bins have also been provided along the supply track, with suitable provision for heating material if necessary so as to permit the work to continue throughout the winter. Several rows of forms are built on each side of these material bins and locomotive cranes will be used to handle the material to the mixers. The slabs vary in weight from 5 to 30 tons, and will be transported to place with the cranes.

ORGANIZATION

The organization for handling this construction work has been modeled as far as practicable on the lines of a general contracting company. Practically all of the men in responsible charge, as well as most of the foremen, have had more or less experience in contractors' organizations. The engineer of track elevation reports directly to the chief engineer and works in close alliance with the operating department, exercising general supervision over all the work. A general foreman, with two assistant general foremen, one assigned to track and grading and the other to concrete work, have direct charge of the execution of the work. These men are held personally responsible for the showing made in their respective divisions and considerable freedom is given them in handling their men so as to get the best results. An assistant engineer, with a small engineering party, performs the usual duties of a resident engineer, giving levels, staking out foundations and inspecting all the work, as well as checking over plans after they have been received from the designing engineers. The engineers are held responsible for securing the finished job in accordance with the plans and specifications, in exactly the same manner as if the work was being performed by a contractor.



Two Views of the Interior of the Field Office Car Showing Opposite Ends

Everything having to do with the execution of the work is handled in the field, including the entire clerical, accounting and material features. This allows prompt handling with the minimum amount of office detail. Joint representatives of the regular accounting and supply departments are placed on the track elevation force, which enables careful and accurate records and properly distributed accounts to be kept and also avoids the duplication of work in the general offices.

All purchases are made by the general purchasing agent, who co-operates closely with the engineering department. Direct communication through a composite telephone line is provided with the system storehouse at Silvis, Ill., about 175 miles west, which enables the field office to secure stock material on one day's notice, if necessary. This also enables a minimum stock limit to be kept on hand in the store yard and permits the use of second hand or substituted materials when occasion permits, where by so doing an immediate ex

penditure can be avoided and the company stock taken advantage of.

The stone and sand is obtained from the Chicago Gravel Company, a few miles northeast of Joliet, making a haul of about 40 miles to the work. This material is crushed and washed at the pit and hauled to the work in drop bottom gondolas especially assigned to the service. The engineer of track elevation and the superintendent of car service work in close co-operation to keep the assignment of all cars to the work at a minimum, by prompt transportation and an effort to release cars with expedition.

A large material yard has been constructed at Eighty-ninth street in the wye formed by the main line and the South Chicago branch so that it will be located near the center of

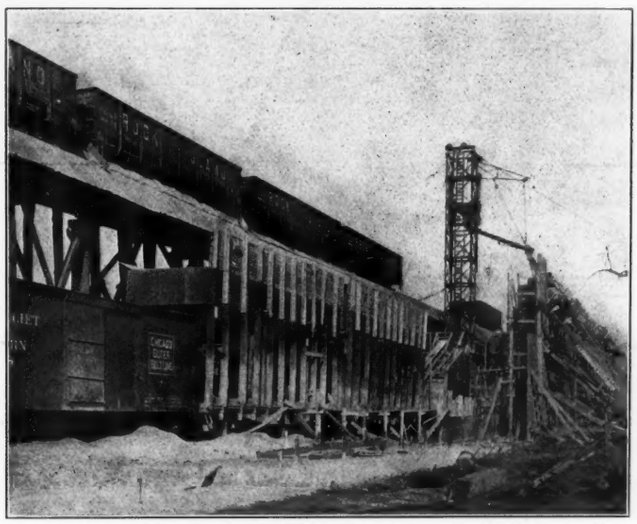
A Portion of the Mixer Car and One of the Material Cars Showing Measuring Hopper and Belt Conveyor

the work during the entire period of track elevation. Switch engines, two 17-ton and one 25-ton locomotive cranes, pile drivers, derrick cars, and the usual supply of pumps and miscellaneous tools used in heavy construction are assigned to the work. A direct connection has been made from the South Chicago branch to the supply yard, which avoids running construction trains through the interlocking plant at Gresham. A small storehouse is provided at the material yard, consisting of two box cars cut through the middle longitudinally and the separate halves moved out and connected up with light framework. This storehouse takes care of the small parts and the miscellaneous supplies that are necessary for the work.

The method of dealing with the men, both those in charge of the work and the laborers, is somewhat unusual in railway service. The field office is a converted 40-ft. wooden mail car, which is kept as near the center of the work as practicable. This car is connected up with electric light and telephone service and the gas tanks and hot water heater supplied in the car are continued in service. This makes a comfortable office at a comparatively small expense. The space is divided into four parts and used respectively by the general foreman and his assistants, engineer, accounting and clerical, and engineer track elevation. Complete files of correspondence, plans, estimates, etc., in fact everything dealing with the execution of the work, are maintained in this office, the purpose being to minimize delay in routine matters as well as eliminate unnecessary correspondence. This portable office saves the cost of temporary offices usually found on construction work and by its portability insures the office being convenient to the center of operations. The comfortable surroundings in the car and complete equipment for properly handling the office work make the work more pleasant than is commonly found in railroad construction work.

Laborers are housed in unusually sanitary bunk cars, which are fitted with steel bunks. A graduated scale of wages and accommodations has been provided in order to hold the men during the busy seasons, which has so far worked out advantageously. New men are paid slightly less than the regular wage, with the understanding that if they are satisfactory their rate will be increased if they remain in the service ten days; at the end of this time this rate is further increased until the maximum wage is reached, and with each raise in wages the men are shifted to more desirable quarters in the bunk and boarding cars and, if practicable, to better gangs. This applies particularly to the floating labor element and has served to materially increase the length of service, as well as securing better laborers and better work. The scale of wages is varied to suit the season and to meet the demand for labor, the effort being to keep the men satisfied with their surroundings with a view to increasing their working capacity, a difficult thing to do in railroad work where the wage rate is less than paid by contractors. The Rock Island labor rate during the last year is reported to have been somewhat lower than the prevailing rate without affecting the efficiency of the work.

Liability insurance on this work is carried separately from the general railway service, and a "first aid" car has been provided, which, like the office car, is kept near the center of the work. The equipment and operation of this car was described in the *Railway Age Gazette* of October 24, 1913. In cases where it becomes necessary the company surgeon is called. An insurance representative meets the physician once



Concrete Mixing Plant with Elevator for Placing Retaining Walls

a week to go over any case which demands attention. As a matter of fact, however, most of the injuries are slight and can be cared for by the men on the work with the facilities provided by this car, the purpose of which is to secure prompt treatment and at the same time do away with the necessity for the men to absent themselves from the work in search of medical assistance.

All plans are prepared under the direction of the chief engineer by the respective engineering sub-departments concerned, working in co-operation with the engineer track elevation. Consultation on various design and construction features of the work is handled in the same manner, the intention being to utilize as far as practicable the special training of the various members of the chief engineer's staff in carrying out this work.

The New Michigan Central Yard at Detroit

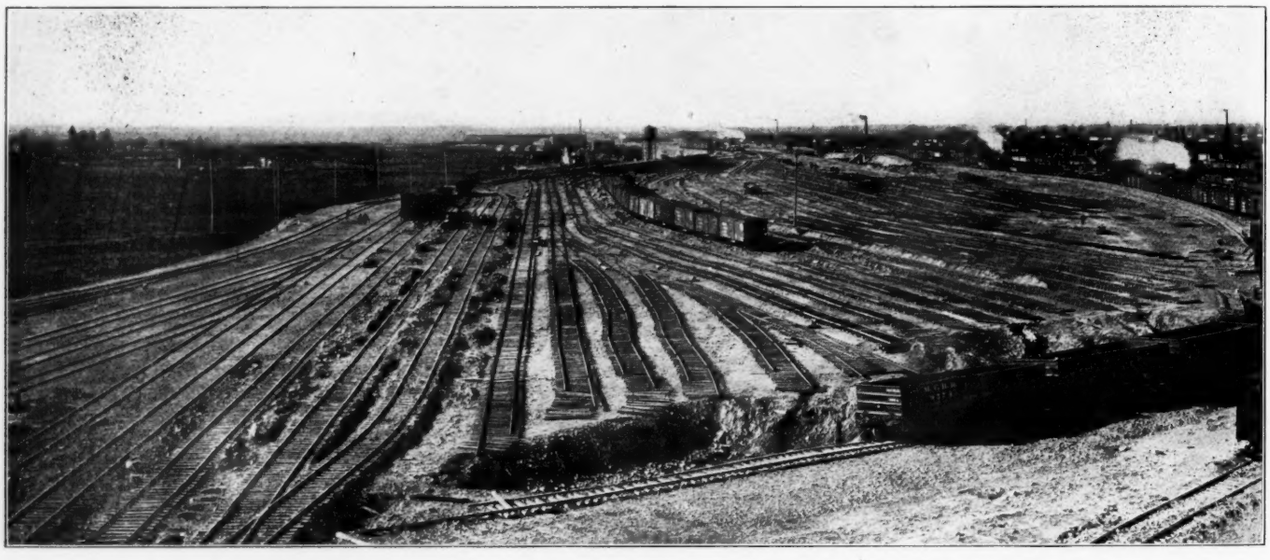
Design and Construction of a 5,500-Car Classification Yard to Be the Third Operated by This Company in Detroit

Although the Michigan Central already operates two yards in Detroit and one just across the river in Windsor, Ont., for the collection, classification and distribution of freight, the company has pushed with unusual speed during the past year the construction of a new classification yard at West Detroit with a capacity of about 5,500 cars. Before the construction of the Detroit river tunnel connecting Detroit with Windsor, very little main line classification was handled here on account of the lack of yard facilities, although the fact that the Bay City and the Toledo branches connect with the main line at Detroit makes this a natural point for such classification. The plans for the improvements made in connection with the building of the tunnel included a classification yard with a capacity of about 3,500 cars on the Windsor side, this location being adopted on account of the impracticability of securing property for a yard in the industrial district along the main line between the Detroit portal of the river tunnel and Bay City junction, where the line branches. A description of the Windsor yard was published in the *Railway Age Gazette* of August 18, 1911. The River Rouge yard on the Toledo division and the North yard on the Bay City line, both of comparatively small capacity, help materially to relieve the congestion in the Windsor yard by handling most of the local business for the branches on which they are located, but the amount of business originating in the industrial district of Detroit has increased so rapidly that none of the roads serving the city have been able to develop fast enough their facilities for handling it.

While the necessity for added yard room in properly handling this local business was the most important factor in the decision to build a new yard in West Detroit, the capacity and arrangement of this yard was designed to handle a large amount of main line classification so as to still further relieve the Windsor yard. A very small yard had been operated west of Bay City junction on the main line, and as the location was well suited to the purpose for which the new yard was needed, the same site with the necessary additional property has been used. The location is very favorable for relieving the local situation on account of the fact that the new outer belt line, owned jointly by the Michigan Central, the Grand Trunk and the Lake Shore and operated by the Detroit Terminal, crosses the Michigan Central main line just west of the west end of the new yard and will serve to bring directly to the yard a large amount of the freight originating along the belt line and will also furnish a short connection with the River Rouge yard. As an indication of the amount of freight which originates in Detroit, the Michigan Central requires 95 switching crews every 24 hours to deliver empty cars and pick up loaded ones from the industries along its various lines in the city.

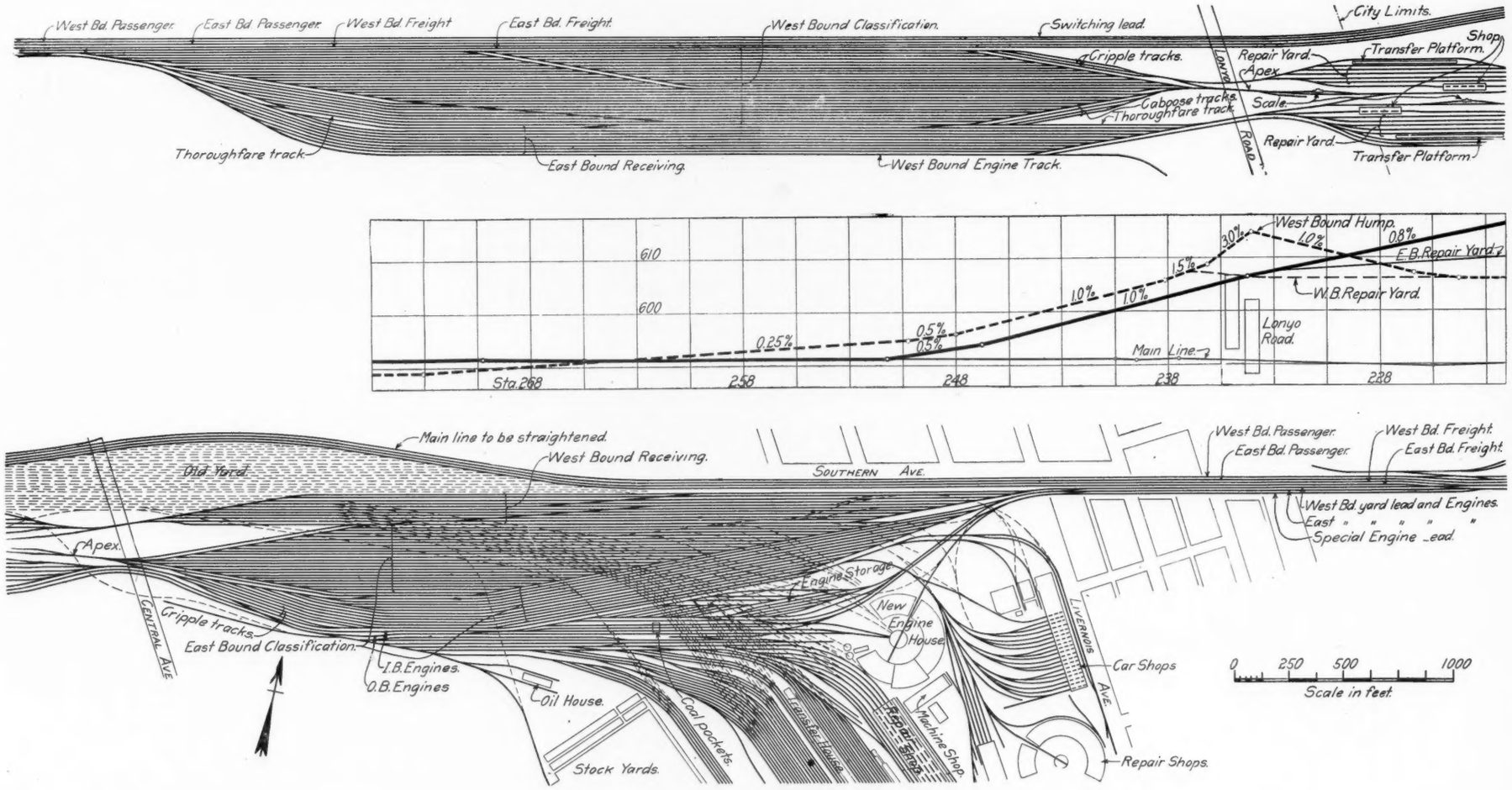
ARRANGEMENT OF YARD

The new yard is located entirely to the south of the four-track main line which will be straightened to eliminate a curve that was necessary to carry it around the old yard. The arrangement is extremely compact. The property occupied by the yard has an extreme length of 2.1 miles and includes about 75 acres. The classification and receiving yards for opposite directions are placed side by side in the usual manner with the two humps near together between the two groups. The space alongside the humps is occupied by repair tracks and a complete engine terminal is located at the east end of the yard. Large car shops adjoin this engine terminal, although these were not a part of the yard development. The old engine house at this location was replaced by a new one immediately previous to the construction work on the yard.



General View of Yard Under Construction, Looking West From the New Coaling Station

The westbound receiving yard has 10 tracks with a total capacity of 792 cars and is divided near the middle by two sets of crossovers to allow a larger number of short drags from local industries to be pulled in and pushed over the hump separately if necessary. The westbound classification yard has 25 tracks with a total capacity of 2,231 cars. In order to provide for the large number of classifications of westbound business that are necessary, without further widening the yard, 14 of the 25 tracks are cut by two parallel and adjacent ladders, dividing these tracks into lengths of about 50 and 40 cars capacity, respectively. The eastbound receiving yard has nine tracks with a total capacity of 865 cars. The design of this yard provided for two sets of crossovers similar to those in the westbound receiving yard, but these were not built. The east-



Plan and Profile of the New Yard Showing Also Location of Old Tracks in the East Half

NOTE.—Same scale is used for plan and profile allowing points to be projected vertically from one to the other.

bound classification yard has 33 tracks with a total capacity of 1,676 cars, these tracks being arranged on three ladders leading from the hump in order to utilize the available space to the best advantage.

The grades over the humps have been fixed from experience gained in operating the Windsor and the River Rouge yards, the accelerating grade having been made 3 per cent. as compared with 2.5 per cent. in the Windsor yard. The 200 ft. of 3 per cent. grade at the top of the hump is followed by 200 ft. of 1.5 per cent. and then about 500 ft. of 1 per cent. grade. The remainder of the eastbound yard is on a 0.3 per cent. or a flat grade and 0.25 per cent. and flat grades are used in the remainder of the westbound yard. The receiving yards are level through the greater part of their length, the approach grades to the hump being 0.8 per cent. and 1 per cent., the choice being principally governed by the necessity for providing clearance over Central avenue and Lonyo road. The type of hump engine to be used on these grades has not been definitely decided, although it will probably be either a decapod similar to the ones used in the Windsor yard, or a Mallet.

The complete yard contains about 73 miles of track and 374 switches. All crossovers and frogs are No. 9 with a ladder angle of 9 deg. 42 min., except in two cases at the outbound end of yards, where 9 deg. 1 min. is used. Manganese frogs and Ajax manganese guard rails are standard. The space between tracks in the yards is generally 13 ft. and 15 ft. alternately, with wider spaces in some cases along thoroughfare tracks and the leads to the engine terminal. The yard tracks are laid with second hand 80-lb. rail on oak ties with gravel ballast. The yard is lighted with flaming arc lights. Track scales will be provided in the classification yards on independent tracks with level grades.

ENGINE TERMINAL

The layout of the engine terminal is very complete and convenient. An ample number of thoroughfare tracks and engine leads are provided throughout the yard to facilitate the movement of engines between the yards and the engine house and two inbound and two outbound leads are provided through the engine terminal. This terminal is designed to handle about 150 locomotives per day. The house contains 43 stalls 90 ft. deep and is provided with an 85-ft. turntable. The building is electric lighted and its equipment includes a National boiler washout system.

A new coaling plant has been built to replace an old trestle plant. The new station is of the Link Belt type, having a storage capacity of 600 tons and a hoisting capacity of 100 tons per hour. The hoist is electrically driven. The plant is of frame and steel construction, provision being made to coal locomotives on four tracks. Steel pockets for dry sand are carried on the sides of the bins over all four tracks.

The clinker pits are located under the two inbound engine leads with a depressed track for ash cars between them. Each pit is 200 ft. long. The water supply for the terminal is secured from the city mains and stored in three tanks, one with a capacity of 50,000 gal. being located near Central avenue, one of 100,000 gal. at the west end of the yard and one of 100,000 gal. at the engine house. Penstocks are provided at convenient points along all engine leads. The track layout of the engine terminal includes two engine storage yards with a total capacity of 30 engines in addition to tracks for wrecker, snow plows, ash and coal cars, etc.

In addition to the main classification yards, the complete development includes a number of minor yards and numerous transfer and shop leads. In the eastbound classification yard provision is made for 33 bad order cars and in the westbound yard for 27. All heavy repairs will be made in the car shops, adjacent to the east end of the yard. The three caboose tracks located along the westbound classification yard have a capacity of 26 cabooses. The two repair yards alongside the humps have a combined capacity of 218 cars, each yard being provided with a shop and a transfer platform, the latter accommodating 11 cars on each side. A 40,000-ton ice house for icing refrigerator cars in transit has been built to replace two old houses which will be torn down.

CONSTRUCTION

The new yard is laid entirely on fill, which required approximately 1,300,000 cu. yd. The material used was clay which was hauled from two pits, one located just west of Ypsilanti, about 27 miles, and one west of Ann Arbor, about 37 miles from the new yard. As it was essential that the work be pushed as fast as possible, the company operated two shovels in the Ann Arbor pit on both night and day shifts and the contractor who excavated and loaded the material in the Ypsilanti pit also used two shovels and worked night and day shifts. The material from the Ann Arbor pit was handled in 200 Rodger ballast cars and a variable number of flat cars. The Rodger ballast cars were loaded with an average of about 30 yd. and the flat cars with about 12 yd. The contractor used Western air dump cars of 12, 16 and 30-yd. capacity for hauling the material from Ypsilanti. The two pits loaded as many as 17 trains per day, requiring 34 train movements over a line that was already handling a very heavy business. Including these material trains as many as 150 trains a day were sometimes operated over the district between Jackson and Detroit. A force of about 600 men was employed at the yard and as the season was unusually dry it was possible to make a very favorable record. The two outfits were able to place as high as 10,000 yd. of fill per day, the maximum output per month being 25,000 yd. In most cases the tracks were raised on the fill, the maximum depth of fill made by this method being about 28 ft. Some construction trestle was built under the humps.

The work at the east end was very much complicated by the necessity for keeping the old yard in service and keeping open the necessary leads to the engine terminal, car shops, transfer house, stock yards, etc. The leads along the south side of the eastbound classification yard were finished and put in operation before the old yard was disturbed so as to provide an entrance to the transfer house, stock yards and repair shops. The work on the new coaling station and clinker pits was pushed as rapidly as possible to allow the old engine facilities located a short distance north of the new ones to be removed, which in turn would allow the new leads to be put in service. Considerable shifting of the roundhouse leads was required in order to handle this development and during the time required to build the new engine terminal facilities filling operations were concentrated on that part of the classification yard west of the old leads. The accompanying photograph, which was taken from the top of the new coaling station looking west, shows the tracks laid in the eastbound classification yard as far as this new fill had been completed. With the new engine terminal in service, practically all of the necessary leads can be carried through and south of the terminal so as to allow the remainder of the classification yard and the westbound receiving yard to be finished.

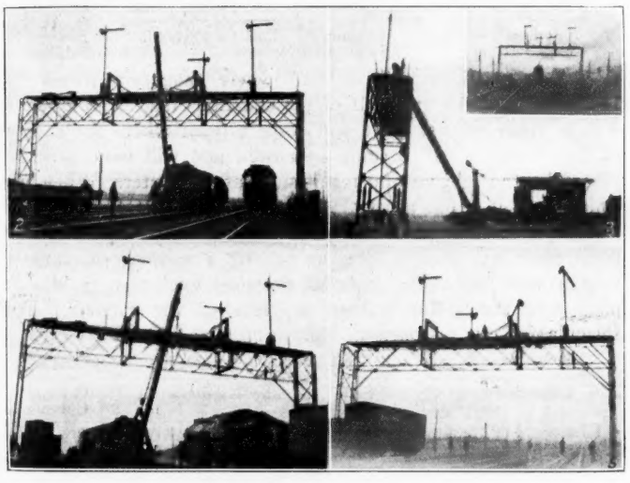
The construction of the yard involved the separation of grades at two street crossings, Central avenue and Lonyo road, both of which cross under the hump approaches. Two structures are required for the yard tracks at each street. The approach to the westbound hump is carried over Central avenue on a single track structure and the leads from the eastbound hump to the classification yard are carried over that street on a seven-track structure. As the street is only 60 ft. wide, columns were provided on the curb lines only. The piers and abutments are of reinforced concrete, the pier caps and the deck being of I beams encased in concrete. Two double-track bridges are required over Lonyo road, these bridges having both curb and center piers, as the street is 66 ft. wide. The type of construction is the same as the Central avenue bridges. About 4,000 cu. yd. of concrete was required for these bridges. The only other important concrete work in the yard was the extension of a 16-ft. reinforced concrete arch culvert carrying Baby creek under the yard. This required about 3,800 yd. of concrete.

The work on the new yard was started about April, 1913. The engine terminal and about 95 per cent. of the filling had been completed up to December 1. A portion of the grading work was handled under contract by J. R. Patton, Chicago, and the construction of the two bridges and the Baby creek culvert was let to the Engineering & Construction Company, Cleveland. This work was handled under the direction of G. H. Webb, chief engineer, and J. F. Deimling, formerly engineer of construction and later assistant chief engineer.

QUICK TRANSFERENCE OF SIGNAL BRIDGES

By C. E. Lindsay
Division Engineer, New York Central & Hudson River, Albany, N. Y.

In the transition from the lock and block system of signaling to the automatic system on the New York Central and Hudson River four-track system, it became necessary to relocate several signal bridges. Many of these bridges had been in use since the original installation of the lock and block system many years ago, and the operator was located in a small house perched on one end of the bridge. As switches and crossovers were gradually located at more or less regular intervals in the vicinity of these tower bridges, it became desirable to interlock them with each other and with the signals, the houses were removed from the bridges and two-story signal stations were built nearby. The introduction of automatic signals has eliminated many of these signal stations where few or no switches were located and they have in turn been removed.



(1) Bridge in Service at Old Location at 11.15 A. M.
(2) Ready to Move Bridge
(3) Derrick Backing Away with Bridge Swinging
(4) Movement Stopped to Allow Freight Train to Pass
(5) Bridge in Place in New Position, 12.35 P. M.

In locating and spacing the automatic signals it was not possible to utilize the bridges in their old location and it became necessary to move them. Very often it was necessary to change the location of the bridge and the character of the signals simultaneously. At first it was the practice to erect a spare bridge in the new location, place spare signals on it and change the blades at a given time. The released bridge was taken down with a long boom derrick car which lifted off the truss, the posts being guyed, swinging it round parallel with the rails and placing it on cars standing on an adjacent track. The legs were later disconnected from the foundation and loaded. The foundation was wasted.

To reduce the cost, delay and danger to operation by this process, the plan of lifting the bridge bodily, legs, truss, signals, foundations and all, was successfully tried and has since been frequently used. On account of the age, design and physical condition of some of the bridges, it was thought best to guard against damage due to a reversal of strains in any of the members by the use of temporary trussing, as shown in the illustrations.

The accompanying illustrations show the actual moving of a signal bridge at Canastota, N. Y., and are in general typical. Fig. 1 shows the bridge in the old location with all signals in use and the derrick train arriving at the bridge at 11:15 a. m. Fig 2. was taken at 11:44 a. m. with the derrick set and the hitch made to the bridge ready to lift it as soon as the passenger train passed. Signal No. 3 had been removed temporarily to make room for the derrick. Fig. 3 shows the derrick backing away and carrying the bridge complete. Fig. 4 was taken at 12:10 p. m. and shows the derrick stopped for five minutes with the bridge suspended to allow a freight train to pass. The bridge was lowered in its new position at 12:13 p. m. and the signals on tracks 1 and 4 were returned to service at 12:17 p. m. Fig. 5, taken at 12:35 p. m., shows all signals in service.

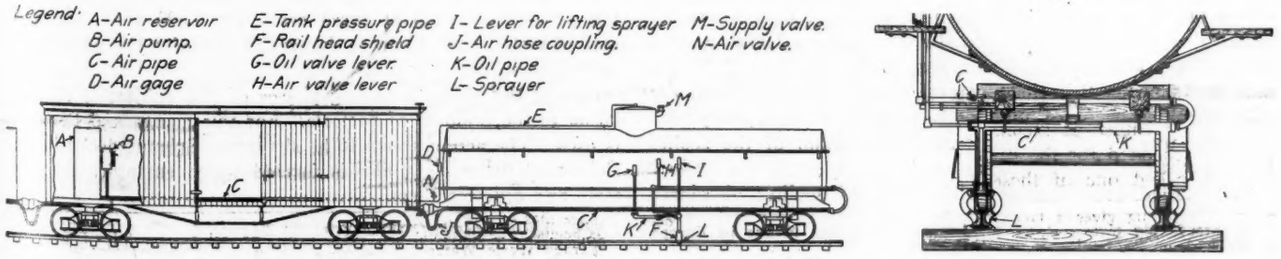
The work was done on March 25, 1912, with moderate weather conditions and with practically no delay to traffic. The bridge was moved 1,282 ft. on tangent in 24 minutes. The signals were out of service on the track on which the derrick worked a total of 51 minutes and on other three tracks 33 minutes.

The cost of changing the location of a signal bridge by this method is about one-fourth that by the other method described, without counting the value of the spare bridge and signals. Bridges have also been carried round curves by running the derrick on the intermediate track nearest the center of the curve to overcome the effect of the superelevation.

A TRACK OILING DEVICE

The Delaware, Lackawanna & Western has been devoting much attention to the proper care of track fastenings. One result of this study is the device illustrated in the accompanying drawing for spraying the fastenings with oil. This consists essentially of a standard oil tank connected to an air flanging machine. The air is stored in large reservoirs and is connected with the oil tank, maintaining in the latter a pressure of from 10 to 20 lb. The spraying device secures its pressure either from the train air line or from the storage tank, working at from 30 to 60 lb. pressure as necessary. The air is conveyed to the spray nozzles by small pipes inside of the regular oil feed pipe. The air and oil are controlled by levers which also enable the spraying nozzles to be raised or lowered as desired.

With this device it has been possible to spray 50 miles of



Elevation and Cross Section of Track Oiling Car on Lackawanna

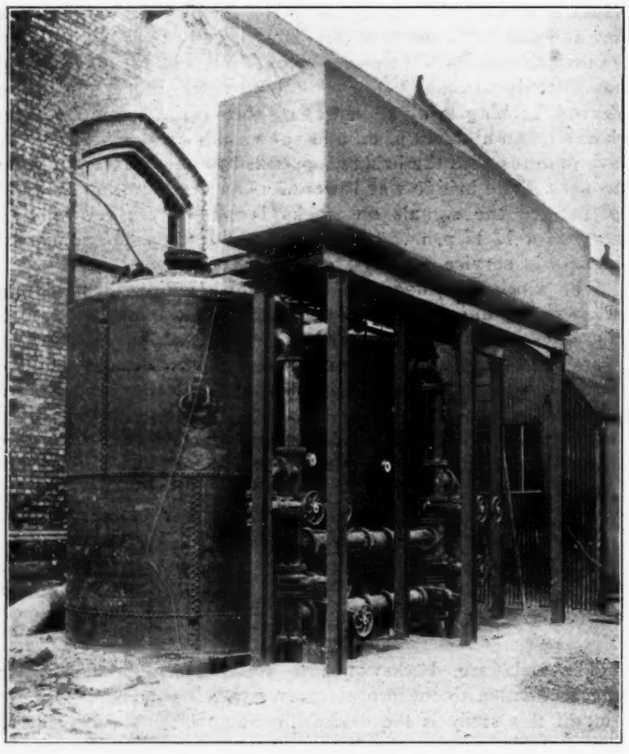
track per day, covering the web, a portion of the head and the base of the rail as well as tie plates, spikes and other fastenings. The cost per mile including train service, oil, and the wages of two men required to operate the car is about $7.50.

PERMUTIT—A NEW PROCESS OF WATER SOFTENING

By Paul M. LaBach

Assistant Engineer, Chicago, Rock Island & Pacific, Chicago, Ill.

Chemists have been familiar with the fact for a number of years, that certain substances found in nature possess the power of softening water by the removal of the mineral salts found in solution in almost all surface or well waters. These impurities are usually the carbonates of lime and magnesia and the sulphates of the same substances. The first forms soft scales in boilers, while the latter forms what is known as hard scale. In railroad practice these substances have generally been removed up to the present time by the use of lime and soda ash.



A Permutit Plant in Operation; the Upper Tank Contains a Salt Solution

Various appliances involving the same principle but with different mechanical devices for the mixing of the reagents have been invented and patented, and are known by the trade names. That the softening of boiler feed water has come to be considered an important matter is shown by the large number of different manufacturers engaged in promoting them both in this country and in Europe.* The importance of the subject led a number of German chemists to experiment with these natural filters, but for a long time the subject was more of a laboratory study than anything else. Finally Dr. Robert Gans, a professor at the Mining School at Berlin, made a number of demonstrations showing that these natural water softeners, which are called zeolites, were of two kinds. These zeolites purify water by a transfer of metallic bases, the sodium of the zeolite being exchanged for the calcium and magnesium in the water.†

Gans called one of these subdivisions of zeolites aluminate silicate. The next step was to manufacture an artificial zeolite. After numerous experiments extending over a number of years‡ Gans finally succeeded by melting in an electric furnace, 3 parts of kaolin, 6 parts of sand and 12 parts of soda, giving a substance which is flaky in texture and pearl gray in color. It is also hydroscopic and should be sealed when in storage. The formula for this compound is:

$$Al_2O_3 + 10\,SiO_2 + 10\,Na_2O$$

Dr. Gans named the artificial compound Permutit from the Latin word "Permutare"—to exchange. His process was perfected in 1907. Great care has to be taken in the manufacture in getting the right degree of heat, the necessary time of digesting, etc. The process was then installed in a German manufacturing plant where they perfected the mechanical appliances necessary and put the Permutit filter on the market in 1909. It has been patented in Europe and America.

The operation of these filters is comparatively simple, as the Permutit is simply used as a filter bed. Where the water percolates through this an interchange of bases takes place according to the stoichiometric laws of chemistry. The calcium and magnesium of the water combine with the Permutit and release the sodium in solution. This is shown in the following formulae:§

$$\underbrace{2\,SiO_2+Al_2O_3+Na_2O}_{\text{Sodium Permutit}} + \underbrace{CaH_2(CO_3)}_{\substack{\text{Calcium}\\\text{Carbonate}}} = \underbrace{2\,SiO_2+Al_2O_3+CaO}_{\text{Calcium Permutit}} + \underbrace{2\,NaHCO_3}_{\substack{\text{Sodium}\\\text{Carbonate}}}$$

$$\underbrace{2\,SiO_2+Al_2O_3+Na_2O}_{\text{Sodium Permutit}} + \underbrace{CaSO_4}_{\substack{\text{Calcium}\\\text{Sulphate}}} = \underbrace{2\,SiO_2+Al_2O_3+CaO}_{\text{Calcium Permutit}} + \underbrace{Na_2SO_4}_{\substack{\text{Sodium}\\\text{Sulphate}}}$$

Similar reactions will be had where magnesia forms the second part of the first half of the equations instead of calcium.

It is apparent that there will come a point where the sodium of the Permutit will become exhausted and will have been replaced by the calcium and magnesium of the water. When this time comes it is not necessary to recharge the filter with a new supply of Permutit, as the Permutit can be "regenerated" and restored to its original form by placing a solution of common salt in the filter. The laws of chemical exchange again take place and the sodium takes the place of the calcium. The formula for this action is as follows:

$$\underbrace{2\,SiO_2+Al_2O_3+CaO}_{\text{Calcium Permutit}} + \underbrace{2\,NaCl}_{\text{Salt}} = \underbrace{2\,SiO_2+Al_2O_3+Na_2O}_{\text{Sodium Permutit}} + \underbrace{CaCl_2}_{\substack{\text{Calcium}\\\text{Chloride}}}$$

Chemical experiments have shown that there is very little loss in the regeneration. The salt solution is admitted slowly and allowed to stand four or five hours and is then drawn off. There is no sludge and the salt residue may be discharged into an ordinary sewer without clogging.

The great advantage of the Permutit process is that it produces zero water automatically. It has been found by experiment that a bed from 2 to 3½ ft. deep will take out all the impurities when ordinary water percolates at a rate not to exceed 16 ft. an hour. This speed may be easily regulated and all that is necessary is to provide a bed thick enough for the worst water found during the year. It is apparent that it will require little attention, as there will be no shifting or changing of proportions of reagents.

This Permutit process has been introduced very rapidly in Germany and France. England has also taken it up recently, and there are now several thousand installations abroad.¶

At the present time it is in use in several dyeing establishments in this country. The reports from abroad indicate that the process costs about three cents per 1,000 gal. The first cost of installation, however, is greater than for the partial systems now in common use.

One of the most interesting phases of this subject is that relating to the removal of bacteria. For this manganese Permutit is used. The action seems to be similar to Schmutzdecke in our slow sand filters, as a film is formed which entangles the bacteria and oxidizes them.

*Wehrenfennig gives a large number of the devices in use in Europe in his work on "Softening Boiler-Feed Water."

†Royal Prussian Geological Institute annual reports 1905-6.

‡See files of *Zeitschrift für angewandte Chemie.*

§Chemische Technologie der Organischen Verbindungen, 1912.

¶Trade Waste Waters by Wilson & Calvert.

General News Department

The Committee on Railway Terminals of the Chicago city council has recommended for passage the ordinance for a new union passenger station, which was noticed in the *Railway Age Gazette* of February 20, page 394.

The mail car of train No. 11 on the Southern Railway was robbed on the night of March 5, near Columbia, S. C. The robber intimidated the mail clerk with a pistol, secured a number of sacks of registered mail and jumped off the train.

The Superior Court at Bridgeport, Conn., has sustained the plea of ex-President Mellen's counsel that the indictment of Mr. Mellen for manslaughter in connection with the derailment at Westport in 1912 is defective, but the state's attorney will now file an amended complaint.

The presidents of the principal railroads in the State of New York have appealed to the governor and the legislature to repeal the full crew law, passed last year. The arguments presented were the same as those presented in New Jersey last week. The New York law has been in effect only since last September, but has already cost the roads $506,630.

The Pennsylvania Railroad Company has voted to lay wires underground between New York and Philadelphia, 90 miles, and the directors have authorized the immediate commencement of the work on the 25 mile stretch between Trenton and Rahway appropriating $300,000 for this purpose. By the storm of March 1, all the company's electrical communication was suspended between New York and Philadelphia more than two days.

To William Schwab, conductor on the Sacramento division of the Southern Pacific, has been awarded the replica in bronze of the Harriman memorial safety medal, given by the American Museum of Safety to the employee in the operating department of the winning road who was most conspicuous in the promotion of safety by suggestions and otherwise. Conductor Schwab received the medal a few days ago. He also received a letter from Julius Kruttschnitt, chairman of the executive committee, commending him for his safety promotion efforts.

The Pennsylvania Railroad, as one means of economy, has issued an order that time freight trains shall carry only perishable freight, and other articles the movement of which it is actually necessary to expedite, such as shipments which the company has agreed to move within a certain time. It is expected that, under this order, considerable freight will be transferred to the slower trains and that those terminal yards at which only time freight is handled, will be relieved sufficiently to warrant limiting the working time of the crews to ten hours a day; and that possibly some of the yardmen may be assigned to other duties.

Efficiency tests made on the Pennsylvania in 1913 numbered more than two million. Out of this number 99.9 per cent. showed employees living up to the strict letter of the rules. Sixteen thousand and more tests were made of observance by enginemen of flagman's signals, and in only 11 cases did employees fail in their duty. One hundred and thirty-three thousand observations were made on rules for handling explosives and inflammables, and 152 infractions were found. Observation was made in 137,175 cases to ascertain whether trains were leaving or arriving at stations ahead of time, and only eighteen derelictions were found.

Senator Tillman, of South Carolina, has introduced in Congress a resolution, which has been referred to the Naval Committee, calling for an investigation of the Southern Railway in connection with its alleged neglect of coal traffic to Charleston. It is charged that interests connected with the Southern, which are also connected with coal properties in Virginia, West Virginia, Tennessee and Kentucky, have made arrangements which prevent any natural movement of coal to the port of Charleston. It is declared that the Southern has for ten years had a railroad line of its own from the coal fields, but has moved no coal to Charleston, and has made no provision for the transfer of coal from cars to vessels at that port.

Effective on March 1, a special service (police) department was organized on the Rock Island Lines with the following organization: A superintendent of special service, with headquarters at Chicago; inspectors of special service; three district special agents, with headquarters at Des Moines, Ia.; Topeka, Kan., and El Reno, Okla.; division special agents, and local special officers. The superintendent of special service will report to the second vice-president and have jurisdiction over all matters pertaining to the department. H. H. Germain is appointed to this position. He will appoint the district special agents for the three operating districts, with the approval of the general manager, and they will report jointly to the superintendent of special service and to the general manager.

Records just compiled of careers of the 170 ranking officers of the Pennsylvania Railroad System show that of this number 163, among whom is the president of the company, started "at the bottom." Of officers now in active service four have worked for the road more than fifty years, namely: J. B. Hutchinson, assistant to the vice-president, Philadelphia; A. L. Langdon, traffic manager, Long Island Railroad; E. T. Postlethwaite, assistant to the president, Philadelphia, and E. A. Dawson, manager of the Star Union Line. Twenty-two of the company's officers have been in the service between forty and fifty years; 57 between thirty and forty years, and 59 between twenty and thirty years. Thirty of these 170 officers are between sixty and seventy years old, 61 between fifty and sixty years, 62 between forty and fifty, and 17 between thirty and forty years of age.

Judge Tuttle, of the federal court at Detroit, Mich., has authorized the receiver to grant an increase in wages to telegraph operators on the Pere Marquette. Operators in cities of over 15,000 population will receive $5 a month increase if their pay previously was $70 a month or less, and operators in cities of less than 15,000, who have been receiving $60 a month or less, will receive an increase of $2.50 a month. Operators receiving more than $70 a month and those living in cities of under 15,000 population who receive more than $60 are to receive no increases. A minimum overtime rate of 25 cents an hour was also fixed by the court. The higher cost of living in large cities was taken into account by the court in deciding to give a larger increase to the operators living in cities of over 15,000. The court held that the fact that the enterprise is an unprofitable one does not justify requiring the operators to suffer loss; but that the employees should be satisfied with a lower rate of pay than might be expected from a railroad in good financial condition.

The Baltimore & Ohio has completed its organization for making a valuation of its property, as prescribed by law. The board consists of an advisory committee and a valuation committee. The advisory committee consists of George M. Shriver, second vice-president; Hugh L. Bond, Jr., general counsel, and F. L. Stuart, chief engineer. The valuation committee is H. R. Talcott, engineer of surveys, chairman; J. D. McCubbin, Jr., real estate agent; Jenks B. Jenkins, valuation engineer; R. Marsden Smith, counsel, and J. J. Ekin, general accountant, secretary. Mr. Jenkins regards the Baltimore & Ohio lines as unique, as it will be difficult to obtain some of the information because many records were destroyed by the Baltimore fire. There have been so many changes in facilities since the original road was constructed that the entire property has been renewed in the 86 years it has been in existence. Some sections of the property have been rebuilt three or four times. It is estimated that the final report to the commission will consist of 7,000 to 8,000 documents, including maps, profiles, drawings, plans, estimates and tabulations.

The presidents of the principal railroads in New Jersey have sent a formal petition to the legislature of that state, requesting the repeal of the full crew law which was passed one year ago.

The expense of carrying out this law, wholly unnecessary, has amounted to $295,784, or an amount equal to the interest on $7,394,607. These roads have felt the necessity of making radical reductions in expenses and have stopped improvements, all but the most urgent; yet at the behest of this and other states they have to make large expenditures which bring in no direct return. The claim that the full crew law would promote the safety of travelers or employees has been shown to be utterly unfounded. The New Jersey railroads have also asked the legislature to repeal all laws that require or permit railroads to carry state officers free. Attention is called to the fact that the Congress of the United States and the Constitution of the State of New York, as well as laws in numerous other states, prohibit this class of free transportation. The railroad representatives were unable to find any member of the New Jersey Senate to introduce their bill and so they sent it, with a letter, to the President of the Senate.

Joint Meeting of Signal Engineers and Illuminating Engineers

A joint meeting has been arranged between the Railway Signal Association and the Chicago section of the Illuminating Engineering Society, to be held at 8 p. m. on Friday, April 10, in the auditorium of the Western Society of Engineers, Monadnock Block, Chicago. The following papers will be presented: "Twenty-Minute Talk on the Fundamentals of Illumination," by William A. Durgin; "Illumination of Signals," by Thomas S. Stevens, signal engineer of the Atchison, Topeka & Santa Fe, Topeka, Kan.; "Signal Lenses," by Dr. William Churchill, Corning Glass Works, Corning, N. Y.; "Physiology of the Eye and Its Relation to Signal Affairs," by Dr. Nelson H. Black, of Milwaukee. W. H. Elliott (N. Y. C.), Albany, N. Y., has acted as representative of the Railway Signal Association in arranging this meeting. An informal dinner will be held at the Grand Pacific Hotel preceding the meeting.

Mail-Pay Injustice Perpetuated

Ralph Peters, president of the Long Island Railroad Company and chairman of the Committee on Railway Mail Pay, calls attention to the fact that Congress has passed the bill providing for the expenditures of the post office department for the next fiscal year, but has again failed to compensate the railroads for carrying parcels. The bill is based on estimates of the post office department that next year the parcel post will handle 600,000,000 packages yielding a revenue to the post office of $60,000,000.

The postmaster general in his annual report of December 1, 1913, stated that in view of the prospective "prodigious growth" of the parcel post, "the railroads, of course, will become entitled to additional compensation for this extra service imposed upon them, and the department is engaged in gathering all statistical data necessary for ascertaining a correct basis for fixing a just, fair, and adequate compensation for the service rendered."

On February 17, the railroads' committee was advised by the post office department that it had made a recommendation to Congress that "on account of the increased weight of mails" due to the parcel post, the postmaster general should be authorized to add to the compensation of the railroads not more than one-half of 1 per cent.

This recommendation would have added only $254,000 to the mail pay of all the railroads in the United States.

Congress took no action on the recommendation, evidently considering the proposal too trivial for consideration, and preferring to wait the recommendation of the Joint Congressional Committee now investigating the whole subject.

In Great Britain the railways receive 55 per cent. of the revenues from the parcel post. Before the establishment of the parcel post the railroads in this country received for transporting the mails at least one-fifth of the post office revenue. Assuming that their service is no greater in handling the parcel post than with other mail, this increased revenue of $60,000,000, to the post office department should in all fairness mean increased payments to the railroads of at least $12,000,000.

Nevertheless, the appropriation bill passed by Congress provides no payment to the railroads beyond the provision already made that 5 per cent. might be added to the pay of railroads on which there had not been a weighing since January 1, 1913.

At a time when the Interstate Commerce Commission is insisting that the railroads shall make a fair charge for every service rendered, it seems in the highest degree unjust that no provision should be made adequately to compensate the railroads for providing and operating the transportation machinery without which the mail service would be practically impossible.

Net Profits of Italian Government Railways Less Than Under Private Companies

The Bureau of Railway News and Statistics has issued the following statement on the Italian state railways:

"Italian state railways in the fiscal year 1912-13 saved for net profits a sum not only smaller than that of the previous year, but less than that attained by the private companies working with their smaller capitalization prior to nationalization of the railways eight years ago. On a commercial basis the system would be bankrupt.

"The returns, though incomplete, serve to emphasize the severity with which the universal rise in cost of railway operation has cut into railway profits and the almost invariable fact that government owned and operated systems, free from the necessities felt by a commercial enterprise, and therefore with less incentive to economizing have been the greatest sufferers.

"Total receipts of Italy's railways for 1912-13 amounted to about $116,900,000, a gain of some $4,800,000 over 1912. In the same time working expenses rose to about $92,000,000, while charges expanded to almost $19,000,000, leaving a loss of almost $200,000 in net profits to apply on larger capital. Most of the advance in operating costs may be attributed to wages and fuel. Wages paid in 1912-13, at about $53,000,000, represented an increase of almost $6,000,000 in two years. The average yearly wage per employee has risen in the eight years since nationalization from $276 to $366. On June 30, 1913, there were in the employ of the Italian railways 149,449 men, an increase for the year of 1900. The cost of fuel for the year showed an increase of almost $2,300,000 over 1911-12.

"The net operating revenue estimated as accruing to the state is placed at 2.3 per cent. on the $1,350,000,000 sunk in Italian railways before payment of charges. As Italy pays from 3 to 6 per cent. on her public debt the railways on a commercial basis would be bankrupt. Yet Italy regards its railways not as a commercial but a national instrument. Difficulties in geographical conditions of the country, rendering the application of private capital to some of the more mountainous and poorly populated sections unlikely coupled with a pressing need of bringing North and South into closer and more harmonious relations, have determined the people on government ownership despite the losses from more expensive operation.

"Action already had been taken to recoup the railways for their higher expenses before the unfavorable showing for the year occurred. Under a law of April, 1911, the government advanced rates on passenger traffic from 6 to 9 per cent. and added 2½ centimes a ton to the rates of freight shipments."

Government to Build Railroad in Alaska

The Alaska Railway bill, providing for the construction of a thousand miles of railroad by the government and the expenditure of $35,000,000, has been passed by both houses of Congress, the Senate having adopted on Tuesday the conference report already adopted by the House. President Wilson has indicated his intention of signing the bill at once; and tentative plans for proceeding with the work already have been considered at the Interior Department. Secretary Lane, long an advocate of the project, is prepared to go ahead with it as soon as the president gives the word. The report of the conference committee appointed to settle differences between the two houses was adopted in the Senate by a vote of 42 to 27.

The measure authorizes the construction of not more than one thousand miles of railroad to connect Alaska's coal fields with the coast, the route to be selected by the president. He is to decide whether or not existing railroad lines in the territory shall be bought to be made a part of the government system, and whether the road is to be operated by the government or leased, after it is built.

The House eliminated from the bill a provision authorizing a bond issue of $35,000,000 to finance the railroad and to be paid off by the proceeds of government land sales in Alaska, and under the amended measure the project will be financed out of

the current funds in the treasury. Congress will have to appropriate each year the amount necessary for construction.

The bill provides for the construction of a road "not to exceed 1,000 miles, to be so located as to connect one or more of the open Pacific ocean harbors on the southern coast of Alaska with the navigable waters in the interior of Alaska, and with a coal field or fields yielding coal sufficient in quality and quantity for naval use, so as to best aid in the development of the agricultural and mineral or other resources of Alaska."

Public Sentiment Favorable to the New Haven

A "committee of one hundred" of the Chamber of Commerce of Providence, R. I., has adopted resolutions declaring that public sentiment is not in favor of requiring the New Haven road to divest itself of its interest in the Fall River and Providence lines of steamers between Narragansett Bay and New York. With separate ownership, it is believed that friction and delay would ensue at the wharves and that much of the Sound traffic would be forced on the railroad.

The *Providence Journal,* commenting on the action of the Chamber of Commerce, says that the New Haven road could not complain if other boat lines, such, for example, as the Joy line, had to be given up.

The correspondent of the New York *Evening Post,* writing from Hartford, Conn., says that public sentiment in Connecticut at the present time—not only the sentiment of stockholders and others interested, but also of the general public—is inclined to call upon the government at Washington to refrain from its efforts to compel the New York, New Haven & Hartford to give up its Boston & Maine and other holdings. The *Hartford Courant* has suggested that some stockholder of the road should get out an injunction against the directors to prohibit them from acceding to the attorney general's wishes.

Chairman Elliott of the New Haven road announces that the question whether or not the plans of the attorney general for separating the different properties shall be submitted to will be referred to a meeting of the stockholders of the company. The directors do not wish to assume the responsibility either of complying with the attorney general's demands or of opposing him.

The governor of Massachusetts, in his efforts to punish the New Haven for its past misdeeds, is reported to be desirous of getting rid of two of the members of the Public Utilities Commission of that state, the two members who have been on the board of railroad commissioners for several years past and who apparently are held by the governor to be blameworthy in not having opposed some of the acts of the railroad company.

Chairman Howard Elliott says that the company is preparing a statement showing the disposition of every dollar of the $175,000,000 of new capital raised in the last ten years. Regarding the trusteeship for the Boston & Maine and the possibility of a receiver for that company, Mr. Elliott said:

"I cannot tell from day to day what will happen. Of course, we are working with every ounce of energy that we possess to save the Boston & Maine from receivership and to protect the New England railroad situation. There are millions of our bonds held by the savings banks, and a receivership must be avoided if it is within human power to do so." The allegation of accounting irregularities made against the Chicago, Milwaukee & St. Paul by Commissioner Harlan "was most unfortunate, coming at this time and in the way it did. I cannot quite understand the attitude of Washington. . . . February will be a very bad month. All of the eastern railroads which have reported for January show heavy losses in net earnings, and the month of February will, I fear, be even worse than January. The New England lines are not alone in the matter of falling revenues. We are making some progress with respect to operating economies, but it will take two or three years before we can make any very substantial impression upon the expense account."

The New Haven company has indefinitely postponed the construction of a new passenger station at New Haven. The station at Hartford, recently burned, is to be patched up so that it can be used.

The P. M.—the Perfectly Managed

[From the Wall Street Journal.]

There is a simple solution to the question of government ownership of the railroads. Let Congress empower the Interstate Commerce Commission to acquire for the nation one of several railroad systems now on the bargain counter and operate it as a model to railroads in the conduct of their business. The government would have enormous advantages over the private owner, notably freedom from taxation and interference by state or local authorities.

State regulation was once based upon the theory of justice between one citizen and another. But legislation and regulation now involve the assumption that a government servant knows more about conducting a railroad than the man who has narrowed his intellect by devoting his life to that service. A successful result will mean a general submission of all transportation matters to an inspired higher intelligence. There is something fascinating about the experiment. Why should not the Pere Marquette, bankrupted by state regulation, be selected? It is a railroad engaged in interstate commerce. It has more than 2,300 miles of road, enough to make possible experimental work on the most liberal scale. Its stock could be obtained for a few millions of dollars. The road and its patrons are in desperate need of all the help omniscience can give.

After a reasonable period of rehabilitation, the federal government will have in its hands a model transportation system. It will have solved the problem of satisfying both capital and labor, while rendering the highest grade of service, at rates rigidly fixed at the lowest level.

In fact, with the advantages conceded, the taxpayer may be entitled to stipulate that strict public account of results obtained must be rendered. This would include such unconsidered trifles as maintenance, depreciation, amortization of bond discounts, settlement of damage claims, and the net return made upon the capital employed. Logically, under our system of lawmaking with reason left out, a lawyer is the indicated head of the New Model Government Railroad. Louis D. Brandeis is obviously the man; and no salary would be too large.

Heaping Up Wrath

Samuel Rea, president of the Pennsylvania Railroad, speaking at the annual meeting of the stockholders of the road in Philadelphia last Tuesday, declared that the railroads, in deferring maintenance expenses, had been heaping up wrath against a future day.

"The truth of the situation is that the railroads as a whole have not been spending enough for maintenance and they have been operating economically, and the enforced economies due to the loss of gross revenues and the failure to permit railroads the right to charge reasonable rates for the transportation service performed force them in years of depression to reduce operating costs; but, remember, it is only deferred maintenance, and not a real saving. . . .

"If large numbers of railroad men and others dependent upon railroads for every character of supplies and work are out of employment, and a general loss of confidence exists and suspicion has been engendered, no attempt must be made to place this responsibility upon the railroad managements. They have issued warnings and made petition for fair dealing, but without effect. The time has come when all fair-minded men and investors as a whole must individually and collectively insist on their state and federal Senators, Representatives and governments understanding that they are a part of the nation entitled to at least fair consideration.

"This statement is not made to predict calamity, but it is made to prevent calamity. Heretofore we have used our efforts to influence investors from asserting their rights, but we will no longer occupy that position while every other interest in this country petitions for its own special welfare and is having the benefit of legislative protection.

"The charge that railroads have manipulated their accounts to show increased costs of operation is absolutely untrue, so far as it relates to the Pennsylvania Railroad Company, and other lines as well. . . . Your management is determined that within the limits of reason it will hereafter allow no statement to go unchallenged that reflects on the management or the integrity of its officers. . . .

A telegram denying charges that the maintenance accounts of the Pennsylvania have been manipulated and that the road has attempted in its statements to mislead the public was sent to Chairman Clark of the Interstate Commerce Commission by Mr. Rea.

Lehigh Valley Premiums

N. D. Kulp, yard conductor on the New York division of the Lehigh Valley, heads the railroad's roll of honor for the year 1913 for having made the best safety suggestion. He and six other men only, one to a division, will be entitled to wear the gold button presented by the General Safety Committee. Kulp's suggestion is that all cars in piers and warehouses be kept coupled, so that they can be pulled out quickly in case of fire and not necessitate the endangering of lives coupling during a fire.

Kulp and the other six men will each get a month's vacation with pay, and the New York division will be presented with a banner by General Manager J. F. Maguire for having the best general safety record for the year.

W. T. Morris, section foreman at South Plainfield, N. J., on the New Jersey and Lehigh division, has been placed on the honor roll from his division for suggesting the use of a whistle to warn section men of approaching trains. J. P. Hoosier, locomotive engineer on the Mahanoy and Hazleton division, has received the same distinction for suggesting that helping engines on a grade couple the air brakes on all occasions. Dennis McGuire, also an engineer, made the best safety suggestion for the Wyoming division by recommending that engine inspectors be provided with magnifying glasses to detect cracks or flaws in axles, rods or other parts of engines. On the Auburn division Harry Henninger, a fireman, was placed on the honor roll for suggesting that a small catch be provided to hold coal doors of engine tenders in place, thereby minimizing danger. Another fireman, Joseph Pruyne, carried off the honors on the Buffalo division by suggesting that all fire tools be carried on the right side of the engine, so they will not interfere with trains on the opposite track if they should happen to fall off. The seventh button goes to James Powers, a gang foreman in the Sayre shops, for suggesting an important change in the swivel on the chain used in connection with the pneumatic drill.

The New York division has had accidents to considerably less than 1 per cent. of the force, and on that account has been awarded the banner for the best general safety record. For the whole railroad, however, the average is not much over 1 per cent.; and this includes all accidents, even the most trivial.

Engineering Meetings During Convention Week

Several meetings of interest and importance to the engineers who will be in Chicago next week in attendance on the meeting of the Railway Signal Association and the convention of the American Railway Engineering Association have been arranged.

On Monday evening, March 16, will be held an extra meeting of the Western Society of Engineers in the society rooms in the Monadnock building, at 8 o'clock, for the further consideration of the question "Factors Determining a Reasonable Charge for Public Utility Service," which subject was discussed in an address at the annual dinner of the society recently by Dr. M. E. Cooley, dean of the engineering school, University of Michigan. Three short talks will be given on various phases of public regulation. Andrews Cooke will discuss "Public Regulation from the Investor's Standpoint." Samuel O. Dunn, editor of the *Railway Age Gazette*, will discuss "Public Utility Valuation from the Railway Point of View," and Harold Almert will discuss "Rate Determination of Public Utilities from the Standpoint of the Student of Public Regulations."

On Monday evening, also, will be held the annual dinner of the retiring president of the American Railway Engineering Association, Edwin F. Wendt, to the board of direction of the association at the Union League Club.

On Tuesday evening, March 17, will be held a testimonial dinner for Professor Ira O. Baker, the head of the civil engineering department of the University of Illinois, in honor of the completion of his forty years of service on the faculty of the College of Engineering of the university. An attendance of approximately 450 is expected, including a very large number of railway engineers, among them being most of the chief engineers of railways having headquarters in Chicago, as well as a number from outside of the city. In the afternoon a reception will be held in the Hotel La Salle, and a dinner will be held at 6:30 p. m. at the La Salle. W. D. Pence, of the engineering board, Interstate Commerce Commission, will preside as toastmaster, and the program will include greetings to Professor Baker by President James of the University of Illinois, and by the presidents of the American Society of Civil Engineers, the Western Society of Engineers, the Society for the Promotion of Engineering Education, the Illinois Society of Engineers, the American Railway Engineering Association, the American Society for Testing Materials and the civil engineering alumni of the University of Illinois.

On Wednesday evening, March 18, will be held the annual banquet of the American Railway Engineering Association at the Congress hotel. The principal speakers at this dinner will be Hon. Charles A. Prouty, director of valuation of the Interstate Commerce Commission; Charles Marcil, member of the Canadian Parliament, Ottawa, and J. M. Schoonmaker, vice-president of the Pittsburgh & Lake Erie.

On Wednesday evening, also, the American Society of Mechanical Engineers, Chicago Section, will hold a dinner and meeting at the Sherman House. The subject of the evening is "Large Steam Power Plants." There will be present at the meeting the men in responsible charge of several of the largest steam power plants in America, who will speak briefly and informally on various stages of the subject. The speakers will be John F. Sparrow, New York Edison Company, New York City; I. E. Moultrop, Edison Electric Illuminating Company, Boston; Jas. B. Andrew, Edison Electric Illuminating Company, Boston; J. W. Parker, Detroit Edison Company, Detroit, Mich.; John Hunter, Union Electric Light & Power Company, St. Louis; W. L. Abbott, Commonwealth Edison Company, Chicago.

The June Conventions

The exhibit committee of the Railway Supply Manufacturers' Association, in planning for the June conventions, held a meeting in Pittsburgh a short time ago. At that time 85 per cent. of the exhibit space was assigned, which compares very favorably with the record at the same time for previous years. There are now available a very few booths in Machinery Hall and some space in the Machinery Hall extension and Exhibit Hall. Every year more or less disappointment is caused because late comers find all of the space assigned and are unable to exhibit. It is suggested that all those who wish to exhibit make immediate application; as applications are coming in now it will be only a short time before all of the space is taken.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Next convention, May 5-8, Hotel Pontchartrain, Detroit, Mich.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 19, St. Louis.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Next convention, April 21, Houston, Tex.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Thursday and Friday in May.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConnaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next convention, October 20-22, 1914, Los Angeles, Cal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 17-20, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Karpen Building, Chicago. June 15-17, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga. Next convention, July 20-22, Hotel Sherman, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Next annual meeting, June 30 to July 4, Hotel Traymore, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 West 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. June 16-19, St. Paul-Minneapolis, Minn.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 19-21, 1915, Chicago.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, Highland Park, Ill. Annual meeting, June 24, Minneapolis, Minn.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. W. Egan, B. & O., Baltimore, Md. Next convention, May, St. Paul, Minn.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago. Next convention, May 20-23, New Orleans, La.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Detroit, Mich. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and August, Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.
CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after second Saturday, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. H. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, May 13, Hotel Galvez, Galveston, Tex.
GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual convention, May 18-22, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 14-17, Hotel Sherman, Chicago.
INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Next convention, third Tuesday in August.
MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo. Next convention, November 17-19, 1914, Detroit, Mich.
MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Next annual meeting, May 26-29, Hotel Waldron, Philadelphia.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Karpen building, Chicago. June 10-12, Atlantic City, N. J.
MASTER CAR & LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Next convention, September 8-11, Nashville, Tenn.
NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.
NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3rd Friday in month, except June, July and August, New York.
NORTHERN RAILROAD CLUB.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York.
RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.
RAILWAY FIRE PROTECTION ASSOCIATION.—C. B. Edwards, Mobile & Ohio, Mobile, Ala.
RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo.
RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Chicago, March 16; New York, June 9. Annual meeting, Bluff Point, N. Y., September 22.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Next convention, May 18-20, Hotel Raleigh, Washington, D. C.
RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.
RAILWAY TELEGRAPH & TELEPHONE APPLIANCE ASSOCIATION.—G. A. Nelson, 50 Church St., New York. Meetings with Assoc. of Ry. Teleg. Supts.
RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Next convention, September 8-10, 1914, Chicago.
ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, 519 Boston building, Salt Lake City, Utah; 1st Saturday of each month, Salt Lake City.
SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.
SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.
TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meetings with Roadmasters' and Maintenance of Way Association.
TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.
TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7122 Stewart Ave., Chicago. Next convention, June 16, Jacksonville, Fla.
TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Next meeting, August, Chicago.
UTAH SOCIETY OF ENGINEERS.—Fred D. Ulmer, Oregon Short Line, Salt Lake City, Utah; 3d Friday of each month, except July and August.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Karpen building, Chicago; 3d Tuesday of each month, except June, July and August.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News

In the city of Charleston, S. C., the sum of $21,000 has been raised to carry on a campaign for "just, reasonable and non-discriminating freight rates"—to and from Charleston. The movement is carried on jointly by the Chamber of Commerce and the city government, the city treasury furnishing nearly half the money. Charles Kimmich, late manager of the traffic bureau, at Knoxville, Tenn., has been engaged to take charge of the campaign.

To aid fruit and vegetable shippers to put their shipments on the market in first class condition, the Southern Railway has issued a circular containing rules governing proper marking and loading. It contains information which was prepared after exhaustive investigation and is illustrated with 28 photographs showing proper and improper methods of packing and loading. One photograph shows a car loaded from end to end and piled high with beans and onions. The containers used were poor and the contents were crushed.

The directors of the Connecticut State Business Men's Association, at a meeting in Hartford last week, appealed to the State Public Utilities Commission against an alleged increase in the rates charged by the express companies for transportation of merchandise. In the resolutions adopted by the directors, it is declared that when the express companies made a general reduction in interstate rates, on the first of February, they at the same time made an advance in the charges for transportation within the state of Connecticut.

Bills have been introduced in the legislature of New York, and have been passed by the senate, looking to the reduction of passenger rates to and from New York City on the New York, New Haven & Hartford and the New York Central. Advances in these rates, both single trip and commutation, made by the roads in 1910, were declared unlawful by the Public Service Commission of the state, but later were sustained by the Supreme Court, in a decision which reversed the opinion of the Public Service Commission. The present movement in the legislature is an expression of the dissatisfaction of the people of Westchester county with the action of the court.

The traffic agents of the Pennsylvania Railroad, reporting from southern early-vegetable territory, say that the fruit and vegetable outlook for the coming season is very favorable. The vegetable acreage in Florida has been increased from 10 to 20 per cent. over 1913, every section having a large acreage of cabbage. The celery crop is the largest ever produced in Florida. Strawberries are beginning to move. It is expected that from 200 to 250 carloads of strawberries will be shipped from Florida before April 1. It is estimated that about 4,500 carloads of tomatoes will be shipped from Florida. The crop of cantaloupes and potatoes will be about normal, it being estimated that the east coast will have about 8,500 acres in the Hastings section devoted to potatoes. It is expected that between 600,000 and 700,000 crates of pineapples will be produced. Cucumbers and watermelons will be plentiful.

California growers who paid the higher freight rate on lemon shipments to the Southern Pacific Company during the recent lemon rate case before the Interstate Commerce Commission will be refunded their excess payments immediately, as a result of the successful application to the Interstate Commerce Commission by the Southern Pacific and other carriers for special permission to make immediate and informal refunds. The United States Supreme Court recently affirmed the commission's decision prescribing a rate of $1 per 100 lb. (instead of $1.15) on lemons to all transcontinental points. The reduction amounts to about $400,000. Charges on between 20,000 and 30,000 carload shipments are involved in the refund. When the commission announced the new rates in 1909, shippers who did not give bonds to protect the carriers in the event that the new rates were upheld, paid the old rate with the understanding that the difference between the new and the old charge should be refunded in case the new one was not upheld. As soon as the Supreme Court affirmed the commission's decision, the railroad

company applied for permission to make immediate refunds. When the advanced rate was first published, a number of friendly shippers paid it without protest and never filed their claims, which, under the law, are now outlawed by the statute of limitations. The Southern Pacific Company, however, has applied for permission to refund excess charges to these shippers, too.

Car Location

The accompanying table, which was taken from bulletin No. 15 of the American Railway Association, gives a summary of freight car location by groups on February 1, 1914.

CAR LOCATION ON FEBRUARY 1, 1914

	New England.	N.Y., N.J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. & So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kans., Colo., Okla., Mo., Ark.	Texas, La., New Mexico.	Oregon, Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Total Cars Owned	88,437	694,081	254,013	205,853	176,504	492,857	20,053	157,279	31,920	137,873	148,725	2,407,595
Home Cars on Home Roads	50,698	444,553	114,158	128,463	108,419	347,981	9,200	95,213	16,579	81,718	99,740	1,496,722
Home Cars on Foreign Roads	37,739	249,528	139,855	77,390	68,085	144,876	10,853	62,066	15,341	56,155	48,985	910,873
Foreign Cars on Home Roads	45,427	240,461	177,316	74,096	68,190	133,199	12,141	63,241	30,597	46,214	30,002	920,884
Total Cars on Line	96,125	685,014	291,474	202,559	176,609	481,180	21,341	158,454	47,176	127,932	129,742	2,417,606
Excess or Deficiency	7,688	*9,067	37,461	*3,294	105	*11,677	1,288	1,175	15,256	*9,941	*18,983	10,011
Surplus	3,226	52,058	32,599	14,976	12,536	20,151	2,570	11,852	4,540	27,139	30,313	211,960
Shortage	665	4	30	161	65	477	...	...	100	30	750	2,282
Shop Cars—												
Home Cars in Home Shops	5,221	49,795	18,504	14,219	11,983	29,796	960	12,978	2,601	6,607	6,881	159,545
Foreign Cars in Home Shops	1,075	6,155	6,037	1,666	1,631	3,772	738	1,994	1,285	2,355	268	26,976
Total Cars in Shops	6,296	55,950	24,541	15,885	13,614	33,568	1,698	14,972	3,886	8,962	7,149	186,521
Per Cent. to Total Cars Owned—												
Home Cars on Home Roads	57.33	64.05	44.94	62.41	61.43	70.60	45.88	60.54	51.94	59.27	67.06	62.17
Total Cars on Line	106.14	98.69	111.67	98.40	100.06	97.63	106.42	98.80	147.79	92.79	87.24	100.42
Home Cars in Home Shops	5.91	7.17	7.28	6.91	6.79	6.08	4.79	8.25	8.15	4.79	4.63	6.63
Foreign Cars in Home Shops	.96	.89	2.38	.81	.92	.77	3.68	1.17	4.02	1.71	.18	1.12
Total Cars in Shops	6.87	8.06	9.66	7.72	7.71	6.85	8.47	9.42	12.17	6.50	4.81	7.75

*Denotes deficiency.

Revenues and Expenses of Large Steam Roads for November

The following figures are compiled from monthly reports of operating revenues and expenses of large steam roads for the month of January, 1914, on hand in the division of statistics, Interstate Commerce Commission, at 1 p. m., March 7, 1914. No reports are included for roads whose operating revenues for the year ended June 30, 1913, did not reach $1,000,000. The figures are compiled as rendered and should not be considered final, inasmuch as scrutiny of the reports may lead to their modification before acceptance.

Item	United States 1914	United States 1913	Eastern District 1914	Eastern District 1913	Southern District 1914	Southern District 1913	Western District 1914	Western District 1913
Number of reports included	164		67		30		67	
FOR THE MONTH OF JANUARY								
Average number of miles operated	217,118.38	215,308.40	56,034.71	55,869.95	39,140.82	39,012.81	121,692.85	120,425.66
Total operating revenues	$219,506,426	$235,680,447	$93,993,227	$105,406,924	$36,988,946	$37,132,268	$88,524,253	$93,141,255
Total operating expenses	169,615,326	174,164,772	78,282,459	79,918,238	27,396,750	26,840,830	63,936,117	67,405,704
Net operating revenue	49,891,100	61,515,675	15,710,768	25,488,686	9,592,196	10,291,428	24,588,126	25,735,551
Revenues per mile	1,011	1,094	1,676	1,887	945	952	726	773
Expenses per mile	781	809	1,396	1,431	700	638	525	560
Net revenue per mile	230	285	280	456	245	264	201	213
FOR THE SEVEN MONTHS ENDING WITH JANUARY								
Average number of miles operated	216,606.13	214,573.10	56,596.06	55,863.56	39,109.70	38,805.55	121,400.37	119,903.99
Total operating revenues	$1,781,381,901	$1,793,232,734	$779,285,249	$788,666,514	$265,162,196	$254,165,683	$736,834,456	$750,400,537
Total operating expenses	1,252,779,456	1,196,720,515	580,609,768	542,494,937	189,213,784	179,329,654	482,955,904	474,895,924
Net operating revenue	528,602,445	596,512,219	198,775,481	246,171,577	75,948,412	74,836,029	253,878,552	275,504,613
Revenues per mile	8,224	8,357	13,894	14,118	6,780	6,550	6,069	6,258
Expenses per mile	5,783	5,577	10,351	9,711	4,838	4,622	3,978	3,961
Net revenue per mile	2,441	2,780	3,543	4,407	1,942	1,928	2,091	2,297
COMPARATIVE FIGURES BASED ON ALL ROADS HAVING REVENUES ABOVE $1,000,000 PER ANNUM REPORTING FOR JANUARY, 1913								
For the Month—	1913	1912	1913	1912	1913	1912	1913	1912
Average number of miles operated	221,726.66	219,628.47	57,876.59	57,782.04	41,678.34	41,258.49	122,176.73	120,577.94
Revenues per mile	$1,091	$931	$1,873	$1,596	$923	$795	$774	$658
Expenses per mile	806	728	1,416	1,251	676	623	562	513
Net revenue per mile	285	203	457	345	257	175	212	145
For Seven Months—								
Average number of miles operated	221,169.67	218,969.20	57,853.82	57,621.01	41,579.62	41,177.49	121,736.23	120,160.70
Revenues per mile	$8,322	$7,519	$14,037	$12,610	$6,414	$9,960	$6,276	$5,611
Expenses per mile	5,550	5,077	9,635	8,648	4,529	4,180	3,973	3,671
Net revenue per mile	2,772	2,442	4,402	3,962	1,885	1,780	2,303	1,940

Traffic on the Pennsylvania Railroad at Philadelphia

The Pennsylvania Railroad, in announcing the proposed improvements at its North Philadelphia passenger station, noted under Railway Construction in the *Railway Age Gazette* of February 27, has issued some figures relating to the company's business at Philadelphia. The road's facilities in that city include 344 miles of track, counting that now building, 31 passenger stations, 24 freight stations and ten river-front stores, flour and hay houses.

The records show that the company received and despatched during the past year approximately 2,500,000 freight cars and that there arrived and departed about 25,000,000 passengers. In addition, 1,000,000 pieces of baggage were checked at the various Philadelphia stations.

The Pennsylvania Railroad operates in and out of Broad street station each day 492 regular passenger trains. There are also 48 trains serving Philadelphia at other stations and 105 trains handling mail in and out of Camden. Trains handling mail in and out of Philadelphia proper on the Pennsylvania number 345, of which no less than 95 per cent. are equipped with complete facilities for sorting mail en route. These trains bring into and carry out of the city about 500,000 lb. of mail each day.

In 1912, the company's total freight and passenger revenue at Philadelphia was $27,519,961.07. In return there was expended in the city $24,371,441, not including dividends, interest on bonds or similar general disbursements. Salaries and wages paid out in the city amount to more than $16,000,000 each year.

During the past ten years, the Pennsylvania Railroad has spent more than $17,000,000 for improvements at Philadelphia. At the present time it is just completing a large grain elevator at Girard Point costing over $1,200,000. It has also determined to electrify its suburban lines to Paoli and to Germantown and Chestnut Hill, to provide at Broad street station for a suburban electric service, to replace with a five-track structure the old two-track structure over the Schuylkill river at Girard avenue and to enlarge the facilities at North Philadelphia, which has become of great importance as a passenger station. Some of these projects are already well under way.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

The commission has suspended from March 8 to July 6 an item in an Illinois Central tariff relating to switching to and from team tracks at the company's Ohio levee.

The commission has issued a supplement to tariff circular No. 18-A amending the regulations governing the construction and filing of freight tariffs, classifications and passenger fare schedules.

The commission has suspended from March 7 to July 5, certain schedules in two tariffs of W. P. Emerson, agent, increasing rates on black strap molasses in tank cars from a number of Louisiana producing points to northern destinations.

The commission has suspended from March 8 to July 6, certain schedules in tariffs of F. A. Leland, agent, increasing class and commodity rates between Shreveport, La., and Texarkana, Ark.-Tex.

The commission has further suspended from March 25 to September 25 a tariff of W. P. Emerson, agent, proposing increased rates on coffee, in carloads, from New Orleans and Port Chalmette, La., to Cincinnati, Louisville, Chicago and other points.

The commission has further suspended from March 25 to September 25 certain schedules in tariffs of the Illinois Central and Louisville & Nashville, cancelling certain allowances for the elevation or transfer of grain, in carloads, at St. Louis, Mo., and East St. Louis, Ill.

The commission has further suspended from March 25 to September 25 a Denver & Salt Lake tariff, increasing rates on soft coal in carloads from Oak Hills and other mines in the same district in Colorado to points on the Rock Island lines in Kansas, Nebraska and Missouri.

The commission has further suspended from March 29 to September 29 certain schedules in a tariff of E. H. Hinton, agent, increasing class and iron and steel rates from Knoxville, Tenn., and certain stations on the Cincinnati, New Orleans & Texas Pacific in Kentucky and Tennessee.

The commission has further suspended from March 25 to September 25, a Buffalo, Attica & Arcade tariff canceling a switching charge of $3 per car for switching service between industries and team tracks on the Buffalo, Attica & Arcade and track connections with the Buffalo & Susquehanna at Arcade, N. Y.

The commission has further suspended from March 20 to September 20 certain schedules in tariffs of the Chicago, Milwaukee & St. Paul and Northern Pacific, cancelling the present commodity rates on cement, in carloads, from Mason City, Ia., and other points, to certain points in Minnesota and North Dakota on the Northern Pacific.

Atlanta Class and Commodity Rates

Atlanta Freight Bureau v. Nashville, Chattanooga & St. Louis et al. Opinion by Commissioner Meyer:

In this decision are included findings in two separate cases, one relating to the class rates to Atlanta from Cincinnati and indirectly from other Ohio river points, and the other to rates to the same city from the eastern port cities of Baltimore, Philadelphia, New York, Boston and the interior points basing on them. In the first, or western case, the commission finds that the rates from Cincinnati to Atlanta should be on a parity to Birmingham, which is approximately equally distant, but that the rates through the other Ohio river crossings from central freight association territory to Atlanta should be in excess of those to Birmingham. The distances to Birmingham are less and other conditions are about the same. In the second, or eastern case, the commission finds that the present adjustment of rates, whether by all rail, ocean and rail, or rail, ocean and rail is not discriminatory to Atlanta as compared to Chattanooga, Nashville and Knoxville. It is also found that New York, Philadelphia and Boston should not be assigned to the same rate basis as Baltimore, and that the present differentials between the all-rail and the ocean and rail rates should not be abolished. (29 I. C. C., 476.)

Emlenton Petroleum Rates

Opinion by Commissioner Harlan:

The commission finds that the extension of the Pennsylvania Railroad's higher Pittsburgh rate on petroleum and its products to Emlenton and certain other points north of Pittsburgh taking the Buffalo rate basis is a proper adjustment for shipments from these points to Milwaukee, and to Detroit, Ann Arbor and other points in Michigan, since such shipments pass through Pittsburgh at lower rates in violation of the fourth section. (29 I. C. C., 519.)

STATE COMMISSIONS

The railroad commission of California has postponed the effective date of its new schedule of express rates for Wells, Fargo & Company from March 1 to March 15.

The Railroad and Warehouse Commission of Minnesota will hold a hearing on March 26 at St. Paul in an investigation of the reasonableness of charges for excess baggage.

The railroad commission of Montana, like that of Georgia, has denied an application by the railways of the state for permission to charge an extra fare for persons who have the exclusive use of drawing rooms, and a fare and a half for persons who have the exclusive use of a compartment.

The Oklahoma Corporation Commission has issued an order directing all express companies operating in the state to put into effect on March 4 new express rates which were promulgated by the commission in 1907 and which have been involved in litigation since that time. The rates were recently sustained by the Supreme Court of the state.

The Illinois Public Utilities Commission has issued an order requiring the posting of passenger train schedules in all stations in the state, effective May 1. The information must be posted upon a bulletin board in a conspicuous place, and all variations of trains from the schedules must be announced seasonably and where necessary must be changed at least every thirty minutes.

A conference of state railroad commissioners for six western states was held at Kansas City on February 28, to outline a plan for opposing the application of eastern railways for an advance in freight rates before the Interstate Commerce Commission at Washington. Clifford Thorne, chairman of the Iowa Railroad Commission, was selected to represent the commissions at Washington.

The Railroad and Warehouse Commission of Minnesota has rendered a decision on a complaint filed by the Minnesota Retail Implement Dealers' Association, against the Chicago, St. Paul, Minneapolis & Omaha, upholding the practice of this company of absorbing switching charges at competitive points, but not absorbing them at points where there is no competition. The commission says that switching is absorbed at competitive points so that the carrier may share in the business at those stations. If this were not done the business would all move over the lines where there were no switching charges to pay, and the company making the charge would be obliged to go out of business at those stations while the shippers at the non-competitive points would gain nothing. Switching is no part of the line haul, the commission says, but is an incidental charge paid to a connecting carrier to get the business, and is neither an unlawful nor an unreasonable charge. An order to the carriers to absorb all switching charges as a penalty for absorbing on competitive business might lead to a refusal to absorb even at the competitive stations, and thus prevent competition between carriers. This, the commission says, is not the intent of the law.

PERSONNEL OF COMMISSIONS

Martin S. Decker has resigned as chairman of the New York Public Service Commission, Second district, and Governor Glynn has designated Commissioner Seymour Van Santvoord

to fill the vacancy. Mr. Decker did not retire from the commission.

George P. Wilson of Philadelphia has been appointed chief of the bureau of tariffs by the Pennsylvania Public Service Commission. Mr. Wilson has been in the freight department of the Pennsylvania Railroad for the past two years, and for five years previous to that time was chief of the freight tariff bureau of the road. He started his railroad service as a boy in the employ of the Philadelphia & Reading, for which company he worked 11 years. He has been with the Pennsylvania about 25 years, for the past two years as a special agent, investigating tariff and traffic problems. The Public Service Commission will soon issue an order requiring all utility companies subject to its jurisdiction to file all rates and tariffs.

Theodore F. Laist, who has been appointed chief architect of the Central district, Division of Valuation, Interstate Commerce Commission, with headquarters at Chicago, as has been already announced in these columns, was born in Cincinnati, Ohio. He was graduated from Cornell University in 1888, and subsequently from 1897 to 1902 he was senior draftsman in the office of the supervising architect of the Treasury Department at Washington, D. C. He was then for three years federal superintendent of public buildings at Washington, at the end of which time he engaged in private practice. In 1910 Mr. Laist became associated with Holabird & Roche, architects, of Chicago, as assistant superintendent, remaining with that firm until his recent appointment as chief architect, Division of Valuation, Interstate Commerce Commission, as above noted. During his residence in Washington Mr. Laist was Professor of Architecture at the Columbian University in that city.

T. F. Laist

COURT NEWS

The Supreme Court of New Jersey has refused to issue a mandamus to compel the Board of Public Utilities Commissioners to approve the proposed lease of the West Jersey & Seashore to the Pennsylvania for 999 years.

Judge Adams of the United States district court at St. Louis has issued a temporary restraining order, enjoining the Wabash from canceling its joint tariffs and percentage divisions with the Illinois Terminal railroad. This road was one of the list of roads included in the cancellation of allowances to industrial roads recently filed by the lines in official classification territory. A question has arisen as to whether the Illinois Terminal railroad is operated by the Illinois Glass Company, or whether it is operated independently, and at the request of some of the roads the Interstate Commerce Commission has recently had a special investigation made by one of its examiners.

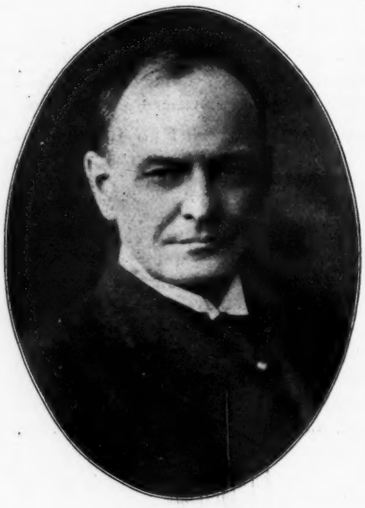
In a news item, published in last week's issue, on the decision of the United States district court at St. Louis in the case against the Terminal Railroad Association of St. Louis, the decree of the court was erroneously stated. The roads are perpetually enjoined from making "any special or so-called arbitrary charge for the use of the terminal facilities in respect of traffic originating within the so-called one hundred mile area, that is not equally and in like manner applied in respect of all other traffic of a like character originating outside of that area." The decree also provides that nothing therein shall be taken to affect the power of the Interstate Commerce Commission over the rates to be charged.

Railway Officers

Executive, Financial, Legal and Accounting

John Scullin, of St. Louis, Mo., has been appointed a receiver of the Missouri & North Arkansas, succeeding George L. Sands, resigned.

Edward H. Lee, who on March 3 was elected vice-president and chief engineer of the Chicago & Western Indiana and the Belt Railway of Chicago, with headquarters at Chicago, as announced in our issue of last week, was born at Dayton, Ohio. He attended the Ohio University, 1877 to 1879, and the University of Wooster, 1883 and 1884. He began railway work in 1880 with the Scioto Valley as rodman, and subsequently to 1887 was with various roads as instrument man, assistant engineer and resident engineer, including the New York, Chicago & St. Louis, the Wisconsin Central and the Union Pacific. He then went to the Elgin, Joliet & Eastern as office engineer, and from 1889 to 1893 was chief engineer of that road. Mr. Lee was engaged in private practice as engineer and superintendent for contractors and in charge of field work for the Sanitary District of Chicago from 1893 to 1898, and since that time has been chief engineer of the Chicago & Western Indiana and Belt Railway of Chicago. In addition to his duties as chief engineer, he now becomes third vice-president, as above noted. Mr. Lee is a member of the American Society of Civil Engineers, American Railway Engineering Association and is president of the Western Society of Engineers.



E. H. Lee

A. G. Whittington, whose election as second vice-president and general manager of the International & Great Northern, with headquarters at Houston, Tex., has already been announced in these columns, was born August 14, 1872, in Milam county, Texas. He was educated in the public schools of Texas and at Baylor University, Waco, Tex., and commenced railway work in 1883 with the Texas & Pacific as messenger and assistant night operator, during which time he began the study of telegraphy. From 1885 to 1893 he was with the Holden Construction Company, railroad contractors, and during the time not in school was employed on various railroads as section hand, section foreman, station porter, station clerk, brakeman, rodman and telegraph operator. He went to the Texas Central in September, 1893, and for three years was agent at various stations and chief clerk, returning

A. G. Whittington

to the Texas & Pacific in September, 1896, where he remained until 1902, as agent, cashier and operator at various stations and soliciting freight agent at Fort Worth, Tex. He then went to the International & Great Northern and was consecutively chief clerk to assistant general freight agent, agent at Mart, Tex.; chief clerk to superintendent of the Fort Worth division, train despatcher, chief despatcher, trainmaster and superintendent of that division, until June, 1911, when he resigned to become superintendent of the Rio Grande division of the Texas & Pacific. In June, 1913, Mr. Whittington again returned to the International & Great Northern as superintendent of the San Antonio division and on December 8 of that year he was made acting general manager, retaining that position until December 29, when he was elected vice-president and general manager, as above noted.

Operating

S. Ennes, superintendent of the Mesabi division of the Great Northern at Superior, Wis., has been appointed general superintendent of the Western Maryland.

C. J. Franklin has resigned as general superintendent of the Portland Railway, Light & Power Company, Portland, Ore., to engage in expert service for public utilities, with office at Portland.

J. B. Norcross has been appointed joint superintendent of telegraph of the Maine Central and the Western Union Telegraph Company, with office at Portland, Me., succeeding E. A. Hall, retired.

G. B. Perdue having been relieved of the duties of trainmaster of the Grand Trunk on account of ill health, R. Kelley has been appointed trainmaster of the 27th and 28th districts, with headquarters at Durand, Mich.

M. S. Kopp has been appointed trainmaster, and C. W. Havens, assistant trainmaster of the Cincinnati, Hamilton & Dayton at Dayton, Ohio. The position of assistant trainmaster at Lima has been abolished. F. C. Donaldson, trainmaster of the Ohio division, has been appointed trainmaster of the Springfield district, with office at Hume, Ill.

G. E. Votaw, superintendent of the Breckenridge division of the Great Northern, at Breckenridge, Minn., has been appointed superintendent of the Mesabi division, with office at Superior, Wis., succeeding S. Ennes, resigned to go to another company. P. F. Keating, superintendent of the Sioux City division at Sioux City, Iowa, succeeds Mr. Votaw. W. D. Mason, trainmaster of the Fergus Falls division at Melrose, Minn., succeeds Mr. Keating, and C. C. Reynolds succeeds Mr. Mason, effective March 10.

Effective March 1, the limits of the Louisiana division of the Texas & Pacific will be from the east limits at Marshall, Texas, to the west yard limits at Addis, including main line and branches. The headquarters of W. H. DeFrance, superintendent of the Louisiana division, have been changed from New Orleans, La., to Alexandria. The territory embraced in the present New Orleans Terminal division and that part of the old Louisiana division from New Orleans to and including Addis yard and the Port Allen branch, including main line and branches, will be known as the New Orleans division. T. S. Mahoney, heretofore superintendent of terminals at New Orleans, La., has been appointed superintendent of the New Orleans division, with office at New Orleans.

Frank Cone, who on March 1, was appointed superintendent of the Beardstown division of the Chicago, Burlington & Quincy, as has already been announced in these columns, was born at Albia, Iowa. He was educated in the public schools at Murray, Iowa, and began railway work in January, 1888, with the Chicago, Burlington & Quincy, with which road he has remained ever since. Until 1907 he was on the Ottumwa division successively as brakeman, conductor, yardmaster at Ottumwa, Iowa, and general yardmaster at Burlington, Iowa. He was then for one year assistant trainmaster on the St. Joe division; from 1908 to 1909, trainmaster of the Ottumwa division, and from the latter date to January, 1912, assistant superintendent of that division. He was then transferred to the Aurora division as assistant superintendent, and in October of that year was made assistant superintendent of the Hannibal division, in charge of the St. Louis terminals. In March, 1913, Mr. Cone was transferred to the LaCrosse division as assistant superintendent, which position he held until his recent promotion to division superintendent, as above noted.

Traffic

C. E. Naylor has been appointed district passenger agent of the Texas & Pacific at New Orleans, La.

Harlan MacMillan, commercial agent of the Rock Island Lines at Mason City, Iowa, has been appointed general agent at that place.

Z. T. Bynum, Jr., has been appointed soliciting freight agent of the Norfolk & Western, with office at Winston-Salem, N. C., succeeding E. H. Stockton, resigned to engage in other business.

H. R. Griswold, assistant general freight agent of the Vandalia at St. Louis, Mo., has been appointed general freight agent of the Grand Rapids & Indiana, with office at Grand Rapids, Mich.

M. E. Newell, commercial agent of the Tennessee Central at Chicago, has been appointed general freight agent, with headquarters at Nashville, Tenn. A. E. Yardley succeeds Mr. Newell.

R. F. Clark, traveling freight agent of the Canadian Northern, with headquarters at Chicago, has been appointed general agent at Pittsburgh, Pa. C. E. Webb succeeds Mr. Clark at Chicago.

Charles E. Phelps, soliciting city passenger agent of the Baltimore & Ohio at Washington, D. C., has been appointed southern traveling passenger agent of the Canadian Pacific, with headquarters at New York.

J. W. Jones, commercial agent of the Central of Georgia at Memphis, Tenn., has been transferred as commercial agent to Cincinnati, Ohio, succeeding G. T. Solar, resigned, and G. M. Rowell succeeds Mr. Jones.

F. S. Sleight, commercial agent of the Missouri, Oklahoma & Gulf at Houston, Tex., has been appointed general agent at Dallas, Tex., succeeding C. E. Christopher, who has been appointed general eastern agent.

David W. Quick has been appointed general agent of the Chicago Great Western at Fargo, N. D., vice Charles A. Fullen, who has been appointed general agent at Winnipeg, Man., succeeding Roy Bullen, resigned to accept service with another company.

J. W. Jacobs, commercial agent of the St. Louis & San Francisco, at Corpus Christi, Tex., has been appointed general freight and passenger agent of the St. Louis, Brownsville & Mexico, with headquarters at Kingsville, Tex., succeeding H. J. Neff, deceased.

C. B. Davis, traveling freight agent of the St. Louis & San Francisco, with headquarters at Houston, Tex., has been appointed commercial agent at Corpus Christi, Tex., succeeding J. W. Jacobs, promoted, and W. S. Smith takes the place of Mr. Davis.

W. T. Hetherington, district freight and passenger agent of the Great Northern at Montreal, Que., has been appointed district freight and passenger agent, with office at Winnipeg, Man., succeeding A. Brostedt, resigned, and A. R. Brooks succeeds Mr. Hetherington.

C. A. Searle, mail traffic manager of the Chicago, Rock Island & Pacific, has been appointed general baggage agent, with headquarters at Chicago, succeeding George F. Lee, deceased. The offices of mail traffic manager and general baggage agent have been consolidated.

J. W. Bingham, chief clerk to the freight traffic manager of the New York Central Lines West, has been appointed general freight agent of the Chicago, Indiana & Southern and the Indiana Harbor Belt, with headquarters at Chicago, succeeding F. Zimmerman, who has been appointed general freight agent of the Lake Shore & Michigan Southern, with headquarters at Cleveland, Ohio, in place of W. A. Newman, transferred.

Engineering and Rolling Stock

W. H. Davies has resigned as road foreman of engines of the Chicago & Alton to go to the Oregon Short Line at Salt Lake City, Utah.

J. H. Ruxton has been appointed superintendent of motive

power of the San Antonio, Uvalde & Gulf, with headquarters at Pleasanton, Tex.

George St. Pierre, master mechanic of the San Francisco-Oakland Terminal Railways, has been appointed superintendent of equipment, with office at Oakland, Cal.

G. Davis, superintendent of the Louisiana division of the Chicago, Rock Island & Pacific, at Eldorado, Ark., has been appointed division engineer of the Oklahoma division, with headquarters at El Reno, Okla.

J. L. Taylor, Jr., has been appointed assistant division engineer of the Erie & Ashtabula division of the Pennsylvania Lines West of Pittsburgh, Northwest System, with office at New Castle, Pa., in place of H. J. Shaw, transferred.

J. H. Roach, assistant engineer of construction of the Lake Shore & Michigan Southern at Cleveland, Ohio, has been appointed engineer in charge of valuation work, with the title of assistant valuation engineer, with headquarters at Cleveland.

H. H. Harsh, division engineer of the Cleveland division of the Baltimore & Ohio System at Wheeling, W. Va., has been transferred to Cleveland, Ohio, as division engineer, succeeding F. J. Bachelder, transferred. G. F. Eberly succeeds Mr. Harsh.

D. M. McKey has been appointed locating engineer of the Seaboard Air Line, succeeding H. S. Thomas, promoted, and L. A. Murr has been appointed assistant engineer with office at Portsmouth, Va., succeeding R. M. Coburn, transferred to the chief engineer's office.

A. G. McClellan, master mechanic of the Chicago & Alton at Bloomington, Ill., has been appointed foreman of locomotive repairs at that place, succeeding W. H. Wundrie, assigned to other duties. The duties of Mr. McClellan have been assumed by M. J. McGraw, master mechanic at Bloomington.

J. M. Morrison, engineer and superintendent of structures of the Central Vermont, at St. Albans, Vt., has been appointed chief engineer of the Southern New England Railroad Corporation and the Southern New England Railway Company, with office at St. Albans, Vt., succeeding H. R. Safford, resigned.

W. B. Kilgore has been appointed road foreman of engines of the Cincinnati, Hamilton & Dayton at Lima, Ohio, with jurisdiction between Troy, Ohio, and Toledo. M. P. Hoban, road foreman of engines, will confine his duties to the territory between Troy and Cincinnati, with office at Dayton. The position of assistant road foreman of engines at Lima has been abolished.

H. J. Shaw, assistant engineer of the Northwest system of the Pennsylvania Lines West of Pittsburgh at New Castle, Pa., has been transferred to Chicago in a similar capacity, succeeding W. E. Guignon, transferred. F. V. Berkey has been appointed assistant engineer of the Zanesville division, Central system, with office at Zanesville, Ohio, succeeding J. A. Rothbrock, transferred.

A. G. McClellan has resigned as master mechanic of the Chicago & Alton, with headquarters at Bloomington, Ill., and the jurisdiction of M. J. McGraw, shop master mechanic at Bloomington, has been extended over both the Northern and Southern divisions. William Naylor has been appointed road foreman of engines at Bloomington, succeeding W. H. Davies, resigned to accept service with another company.

Millard F. Cox, until recently mechanical engineer of the Louisville & Nashville at Louisville, Ky., has been appointed assistant superintendent of machinery, with headquarters at Louisville, and the position of assistant to superintendent of machinery has been abolished. W. M. Bosworth, mechanical engineer of the Kansas City Southern at Pittsburg, Kan., has been appointed mechanical engineer of the Louisville & Nashville, with headquarters at South Louisville shops.

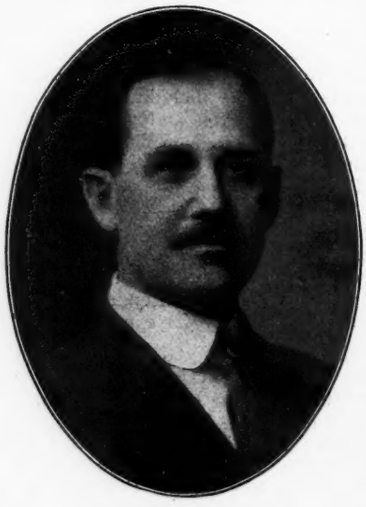
W. E. Ricketson has been appointed mechanical engineer of the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Beech Grove, Ind., succeeding C. A. Brandt, who has been transferred to Indianapolis, Ind., as master mechanic of the Chicago, Michigan, and the Peoria & Eastern divisions. F. Bauer has been appointed assistant master mechanic of the Cleveland-Indianapolis and Cincinnati-Sandusky divisions, with headquarters at Bellefontaine, Ohio, succeeding M. K. Tate, resigned.

J. R. McGraw, division engineer of the Buffalo division of the Pennsylvania Railroad at Buffalo, N. Y., has been appointed division engineer of the Maryland division of the P. B. & W., with office at Wilmington, Del. E. B. Wiseman, division engineer of the Monongahela division at Pittsburgh, Pa., succeeds Mr. McGraw. J. B. Hutchinson, Jr., division engineer of the Williamsport and Susquehanna divisions at Williamsport, succeeds Mr. Wiseman. W. B. Thomson, division engineer of the Elmira division of the Northern Central at Elmira, N. Y., succeeds Mr. Hutchinson. H. L. Thomas, supervisor of the Philadelphia division at Harrisburg, Pa., succeeds Mr. Thomson, and M. L. Smith, transitman at Altoona, Pa., has been appointed assistant supervisor of the Pittsburgh division, with office at Pittsburgh.

J. C. Hoehle, who has been appointed architect of the Louisville & Nashville to succeed John A. Galvin, was born February 28, 1884, and was educated in the public and high schools of Louisville, Ky. He was first employed by J. J. Gaffney, and then with H. P. McDonald, remaining with the latter until he went to the office of the United States Engineer at Louisville, which at that time was under the charge of Major Derby. He next went with the firm of McDonald & Dodd, and later with the Alfred Struck Company of Louisville. Mr. Hoehle began work with the Louisville & Nashville in August, 1905, and was made chief draftsman of the architectural department in the summer of 1912, which position he held until February 14, when he was appointed architect, with headquarters at Louisville, Ky., as above noted.

J. C. Hoehle

J. C. Auten, whose appointment as principal assistant engineer of the Philadelphia, Baltimore & Washington, with headquarters at Wilmington, Del., has been announced in these columns, was born on August 31, 1870, at Montandon, Pa., and was educated in the Sunbury High School. He entered the service of the Pennsylvania Railroad in 1893, as a rodman in the assistant engineer's office on the Sunbury & Shamokin division. On May 1, 1894, he was made acting assistant supervisor on the Philadelphia & Erie, and the following November was promoted to supervisor. He was transferred in October, 1898, as supervisor to the Baltimore division of the Northern Central, and was again transferred in 1901, to the Middle division. He was promoted to assistant engineer of the Elmira & Canandaigua division in 1902, and later served in the same capacity on the Western Pennsylvania division, Eastern & Susquehanna division, and the West Jersey & Seashore. On January 15, 1910, he was promoted to division engineer of the Maryland division, and now becomes principal assistant engineer of the Philadelphia, Baltimore & Washington, as above noted.



J. C. Auten

Purchasing

J. L. Woods has been appointed assistant purchasing agent of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn.

C. R. Craig, until recently purchasing agent of the Mobile & Ohio, at Mobile, Ala., is now purchasing agent of the Southern Railway, with office at Washington, D. C., and J. A. Turner is now purchasing agent of the Mobile & Ohio, with office at Mobile.

F. J. Angier, superintendent of timber preservation of the Baltimore & Ohio, has been appointed storekeeper at Green Spring, W. Va. W. J. Dunlop has been appointed storekeeper at the East Side terminal, Philadelphia, Pa., to succeed H. L. Mortimer. T. H. Barker has been appointed storekeeper at Benwood, W. Va., succeeding R. T. Ravenscroft.

W. E. Lefaivre, whose appointment as purchasing agent of the Denver & Rio Grande, with headquarters at Denver, Colo., has already been announced in these columns, began railway work in September, 1890, with the St. Louis & San Francisco, with which road he remained until December, 1905, when he became chief clerk to the general purchasing agent of the Missouri Pacific, St. Louis, Iron Mountain & Southern, Texas & Pacific, International & Great Northern and the St. Louis Southwestern. Mr. Lefaivre severed his connection with those lines March 1 to accept the position of purchasing agent of the Denver & Rio Grande, as above noted.

OBITUARY

D. E. Fitzgerald, of Springfield, Mo., who resigned recently as assistant superintendent of motive power of the St. Louis & San Francisco, lost his life in the fire which destroyed the Missouri Athletic Club house of St. Louis, Mo., on March 9.

John J. Rogers, commercial agent of the Missouri, Kansas & Texas at Chicago, died in that city March 7, aged 67 years. Mr. Rogers had been connected with the Missouri, Kansas & Texas since November, 1888, and had been in railway service 49 years.

Adolph Butze, formerly general purchasing agent of the Grand Trunk, died at St. Louis, Mo., on March 3, aged 68 years. Mr. Butze began railway work in 1868 with the Wabash, in whose employ he remained for some time. From 1885 to 1887 he was in the purchasing department of the Missouri Pacific, and then became private secretary to the general manager of the Chicago, Indianapolis & Louisville. He was made general purchasing agent of the Grand Trunk in 1896, retiring on January 1, 1912, under the pension rules of the company.

Edward Bourne Gibbs, formerly connected with the Union Pacific at North Platte, Neb., died on March 5 at St. Louis, Mo., aged 80 years. Mr. Gibbs was manager of power and rolling stock of the old Platte County Railroad in 1863, was master of machinery and motive power of the St. Louis & Iron Mountain in 1868, and in 1880 became connected with the Union Pacific at North Platte, Neb. Later he was in charge of the Oregon division of that road at Portland, Ore., and subsequently returned to North Platte, retiring from active service in 1904.

William H. Thomas, formerly superintendent of motive power of the Southern Railway, died on March 7, at his home in Philadelphia. Pa. He was born on September 27, 1842, at Colebrook, Pa., and began railway work in July, 1865, as a foreman of a lathe gang in the shops at Renova, Pa., of the Philadelphia & Erie, now a part of the Pennsylvania Railroad. He was then consecutively foreman of roundhouse, acting master mechanic and foreman of the machine shops at the same place, and then was road foreman of engines on the same road. In July, 1879, he was appointed master mechanic of the Mobile & Montgomery, and the following year became master mechanic of the Nashville & Decatur and Henderson divisions of its successor, the Louisville & Nashville. From September, 1883, for two years, he was master mechanic of the Huntington division of the Chesapeake & Ohio at Huntington, W. Va., and then became superintendent of motive power of the East Tennessee, Virginia & Georgia. From September, 1894, to February, 1896, he was assistant superintendent of motive power of its successor, the Southern Railway, and then to July, 1902, was superintendent of motive power of the same road.

Equipment and Supplies

LOCOMOTIVE BUILDING

THE KANAWHA & MICHIGAN is in the market for 10 locomotives.

THE ILLINOIS CENTRAL has ordered 50 mikado type locomotives from the Baldwin Locomotive Works.

THE CAROLINA, CLINCHFIELD & OHIO is in the market for 6 Mallet type and 3 Pacific type locomotives.

THE BUFFALO, ROCHESTER & PITTSBURGH has ordered 10 mikado type locomotives from the American Locomotive Company.

THE CHICAGO & ILLINOIS MIDLAND has ordered 2 mikado type freight locomotives from the American Locomotive Company. These locomotives will have 22 by 28 in. cylinders, 51 in. driving wheels, and a total weight in working order of 285,000 lb.

THE MISSOURI, KANSAS & TEXAS OF TEXAS has ordered 25 superheater mikado type locomotives for freight service from the American Locomotive Company. These locomotives will have 26½ by 30 in. cylinders, 61 in. driving wheels, a total weight in working order of 285,000 lb., and a steam pressure of 180 lb. Delivery is specified for August or before.

CAR BUILDING

THE LAKE ERIE, FRANKLIN & CLARION has ordered 100 box cars from the Standard Steel Car Company.

THE BANGOR & AROOSTOOK has ordered 89 flat, 34 box and 2 stock cars from the Standard Steel Car Company.

THE BESSEMER & LAKE ERIE is said to be in the market for 3,500 gondola and hopper cars. This item has not been confirmed.

THE ST. LOUIS SOUTHWESTERN is said to have ordered 2,000 cars from the American Car & Foundry Company. This item has not been confirmed.

THE TENNESSEE COPPER COMPANY is in the market for 50 hopper cars. This company has its office at 11 Broadway, New York, and operates mines in Polk county, Tenn.

New Interlocking Machine at North Station, Boston

Tower A, at the North Station, Boston, of the Boston & Maine Railroad, which was destroyed by fire on January 14, was again put in service 25 days thereafter, or on February 8. The machine which was destroyed by fire was one of 119 levers, electro-pneumatic, made by the Union Switch & Signal Company. Telegraphic advice was sent to this company before the fire was out, and an order for a new machine was given on January 16. Some little delay was necessary because of changes to be made in the tracks and the need of a larger machine, the new one having 131 levers. The new machine was shipped by express from the factory at Swissvale February 4. An electro-pneumatic interlocking machine of 131 levers complete was built, assembled, tested, taken apart again, packed and loaded on a car in twenty days.

Inasmuch as this was not a repeat order (the new machine being larger than the old one), the job involved the making of a complete new dog chart, locking and combination sheets; and also the design of a new track model, for the layout of the yard had been changed somewhat since the old machine was installed.

The new machine left Pittsburgh at 9 a. m. February 5 and arrived in Boston February 6. At 10:45 a. m on that day the first crate went into the tower window. The machine was set up by the Signal Department of the road and switches and signal were tested out and the whole put in service at 9 p. m. February 8. During the time that there was no machine the electro-pneumatic switches were operated by manipulating the valves by hand, which required a large force of extra men. As these men became familiar with their duties trains were gradually restored and were operated on a regular basis in less than a week, though in reduced number.

Supply Trade News

Sidney G. Johnson, general sales manager of the Union Switch & Signal Company, has been elected vice-president.

Frank N. Grigg has been appointed sales agent of the Transportation Utilities Company, New York. He will have office at 1201 Virginia Railway & Power building, Richmond, Va.

W. Douglas Waugh, formerly with the Belle Isle Motor Company, Detroit, Mich., has been appointed general sales agent of the Kalamazoo Railway Supply Company, Kalamazoo, Mich.

Louis H. Burns is now representing the injector department of Wm. Sellers & Company, Inc., Philadelphia, Pa., in the middle west. His present address is 9620 S. Winchester avenue, Chicago.

The sales of the Western Electric Company reached a total of approximately $78,000,000 for the year 1913. This means an increase of $6,000,000, or over 8 per cent. as compared to the 1912 sales of approximately $72,000,000.

MacRae's Blue Book Company, Chicago, has purchased the Railway Supply Index-Catalogue, and on March 16 the consolidated publication will go to press under the name of MacRae's Blue Book-The Railway Supply Index Catalogue.

W. L. Anderson, formerly Chicago representative of George E. Molleson Company, New York, has been appointed manager of the railway sales department of the Union Fibre Company, Chicago, manufacturers of cold storage insulation.

The Safety First Manufacturing Company has been organized with offices in the Railway Exchange, Chicago, to handle various high class railway specialties, besides taking over the business of the E. D. E. Company, of which the late Frank M. Gilmore was president.

Stanley W. Midgley, for several years western sales manager of the Curtain Supply Company, has been appointed general sales manager of the Acme Supply Company, with headquarters in the Steger building, Chicago, effective on March 4. Mr. Midgley has been in the railway supply business for the past twelve years, beginning with the National Car Coupler Company as general sales representative, and for the past six years he has been with the Curtain Supply Company as western representative and western sales manager, until his appointment to the present position. Mr. Midgley is the oldest son of J. W. Midgley, who was for over twenty years the commissioner of the Western Freight Association, which comprised the several railroads extending westwardly from Chicago and St. Louis.

S. W. Midgley

Frank J. Schraeder, Jr., formerly with the Roberts & Schaefer Company, Chicago, has formed a partnership with R. E. Gurley, formerly with the T. W. Snow Construction Company, under the name of Gurley & Schraeder, to design and construct coaling stations and coal handling machinery, with offices in the Ellsworth building, Chicago.

The Ingersoll-Rand Company, New York, manufacturing compressed air machinery, has recently enlarged its pneumatic tool department and placed George A. Gallinger, of Pittsburgh, at its head, with the title of manager of pneumatic tool sales. Mr. Gallinger will have his headquarters at the New York office of the company, 11 Broadway.

The Indianapolis, Ind., and Louisville, Ky., branches of the H. W. Johns-Manville Company, New York, have recently been moved to larger quarters. The new address of the former is 408-410 North Capitol avenue, and of the latter 659-661 South Fourth avenue. Both of the new branches are provided with showrooms and ample warehouse accommodations.

Harlow D. Savage has been appointed general eastern sales manager of the American Arch Company, 30 Church street, New York. Mr. Savage was born at Memphis, Tenn., on April 16, 1880. He received his education in the public schools of Ashland, Ky., and at Kenyon Military Academy. Since June, 1897, he has been connected with the Ashland Firebrick Company, Ashland, Ky., having reached the position of assistant secretary and that of treasurer and sales manager. While at Ashland he was at one time in charge of mines of this company and later had complete control of operation. As a part of the latter work he designed and constructed a modern electrically operated firebrick plant at Ashland. He takes up his new work with the American Arch Company, therefore, with a thorough knowledge of the manufacturing side of its business. Mr. Savage is the president of the German Mining & Manufacturing Company and of the Clinton Mining Company. He is a director of the Ashland Firebrick Company and of the Clinton Mining Company. He also holds the position of president of the Refractories Manufacturers' Association. Mr. Savage is also a military aid to the governor of Kentucky with the rank of colonel.

H. D. Savage

J. T. Anthony has been appointed assistant general eastern sales manager of the American Arch Company, New York. Mr. Anthony was born in February, 1883, and graduated from the Georgia School of Technology in 1902. He was then engaged in the textile manufacturing business for a few years and entered the service of the Atlantic Coast Line in 1905. In 1907 he became a draftsman in the motive power department of the Central of Georgia. He remained with that road until 1912, being closely associated with F. F. Gaines, superintendent of motive power, in the work of designing the Gaines combustion chamber. In January, 1912, he entered the employ of the American Arch Company as combustion engineer. One year later he was made assistant to the president and held that position until March 1, 1914, when he was made assistant general eastern sales manager as noted above.

J. T. Anthony

The Automatic Electric Company, Chicago, is installing its automatic telephone system in the general office building of the Louisville & Nashville, at Louisville, Ky. The installation consists of two 200-line boards, of which 216 lines have now been equipped, 20 trunk lines to manual exchanges and 10 each to the Bell company and the Louisville Home Telephone Company. The Automatic Electric Company has recently opened

offices in New York, Buffalo, Pittsburgh, Cleveland, Detroit, Toledo, Indianapolis, Atlanta and Portland, Ore., and will open offices in St. Louis, Kansas City, Des Moines, Milwaukee, Dallas, Los Angeles, Minneapolis and St. Paul.

The employees of the Westinghouse Electric & Manufacturing Company who have been in its employ for 20 years or more held a meeting on February 21 and organized the Veteran Employees' Association of the Westinghouse Electric & Manufacturing Company. A regular business meeting was held to formulate the organization, a set of by-laws was adopted and officers elected for the coming year. A dinner followed at which the toastmaster was L. A. Osborne, vice-president. The speakers were E. M. Herr, president; Charles H. Terry, vice-president, and James J. Barrett, representing the shop. Mr. Herr and Guy E. Tripp, chairman of the board of directors, who was also present, were elected honorary members. About 325 of the employees are eligible to membership, and over 300 of these were present.

Railway Steel-Spring Company

The Railway Steel-Spring Company, New York, at the present time operates works in 11 cities. At the close of business on December 31, 1913, it had total assets of $38,871,753, of which $33,320,525 was in plants and $1,592,801 in materials, supplies and products in process. In 1913 its gross earnings were $7,688,185 and its net $1,472,093. It paid a total of 7 per cent. in dividends on its preferred stock of $13,500,000 and 2 per cent. on its common of equal amount. The total surplus at the end of 1913 was $4,525,203. President Fitzpatrick in his annual report comments on the business conditions of the past year as follows: "Throughout the early part of 1913, the business of this company was of most favorable proportions, nearly all of the plants being operated to their full capacity. About the middle of the year a marked curtailment of buying by the railroads was evident, and since then your company has suffered in general with other manufacturers who rely upon this class of work for the larger portion of their business. The success of your company depends to a very great extent on the well being of the railroads, and when their revenues will again permit them to purchase their necessary requirements, your company will be fully prepared to meet any demand for its products."

Lackawanna Steel Company

The annual report of the Lackawanna Steel Company, Lackawanna, N. Y., recently issued, shows that the company's net income in calendar year 1913 was $3,023,084, the largest of any year in its history. The gross sales of the company and its subsidiaries were $29,879,275, the average price per gross ton being $30.34, an increase of $2.62 over 1912. The company during the year received 2,114,637 tons of iron ore. It produced a total of 986,985 gross tons of coke, 959,995 tons of pig iron and 1,094,530 gross tons of steel ingots. Shipments amounted to 984,921 tons (about the same as in 1912), including 336,339 tons of standard rails, 138,538 tons of structural shapes, 163,887 tons of merchant steel products, etc. Although the net income after deducting the special profit of $267,200 on the sale of Cornwall & Lebanon shares of stock held by the Lackawanna Iron & Steel Company amounted to 7.85 per cent. on the common stock, the directors have not declared any dividends on that stock because of the doubtful outlook for 1914. The surplus of the company and its subsidiaries on December 31, 1913, is thus left at $7,514,877 as compared to $4,839,319 the year before. The report says: "Orders on hand are low, and operations to date (March 2) have been at less than 50 per cent. of full capacity; the outlook for business in the near future is not encouraging, nor can much improvement be expected until the railroads are put in a position that will justify them in purchasing more freely."

TRADE PUBLICATIONS

FOUNDRY EQUIPMENT.—The Whiting Foundry Equipment Company, Harvey, Ill., has recently issued catalog No. 105, describing its electric screw jack locomotive hoist. The same company has also issued a new catalog of elevators and one of brass foundry equipment.

Railway Construction

ATLANTA & NORTH GEORGIA.—Incorporated in Georgia with $1,200,000 capital, to build from Atlanta north to Creighton, 50 miles. A. D. Kellogg, Atlanta, is interested.

CANADIAN NORTHERN.—On the Western division, the Calgary branch has been extended from Munson, Alta., southwest to Calgary.

CANADIAN PACIFIC.—A new branch on the Alberta division has been opened for business from Suffield, Alta., west to Retlaw, 57 miles.

CENTRAL UTAH.—This company, which started surveys last year for a line from Salina, Utah, east through Salina canyon to coal fields, about 20 miles, recently made application for right of way along Salina creek, Sevier county, Utah. It is understood that the line may eventually be extended northeast to Ferron. W. O. Creer, president. (December 19, p. 1207.)

CHERRYVALE, OKLAHOMA & TEXAS.—See Kansas & Oklahoma Southern.

COLORADO ROADS.—An officer of the San Miguel Development Company of Telluride, Col., writes regarding the report that this company plans to build a railroad in Utah, that, in connection with the irrigation of about 100,000 acres in San Miguel and Montrose counties, Colorado, the company has made preliminary surveys for a railroad. The work will be carried out as soon as negotiations with the government are successfully concluded. B. Wells, vice-president, Telluride.

COLUMBIA-CAMDEN (Electric).—Incorporated in South Carolina with $250,000 capital, to build from Columbia, S. C., northeast to Camden, about 35 miles. B. L. Abney is an incorporator.

COLUMBIA, CONGAREE & ORANGEBURG.—Incorporated in South Carolina with $250,000 capital, to build from Columbia south to Orangeburg, about 40 miles. A. J. Bethea, Columbia, is an incorporator.

FAIRMOUNT & VEBLEN.—This company, which finished work last year on the line from Veblen, S. Dak., northeast to Fairmount, N. Dak., 50 miles, will probably build an extension from Veblen, southwest to Webster on the Chicago, Milwaukee & St. Paul, about 40 miles. Julius Rosholt, president, Minneapolis, Minn., and J. H. Thomas, chief engineer, Fairmount, N. Dak.

FARNHAM & GRANBY.—Incorporation is being asked for in Canada to build from a point on the Canadian Pacific at or near Farnham, Que., north to Granby, thence northeasterly through to Windsor Mills, or to Richmond, about 60 miles. Pringle, Thompson, Burgess & Cote, Ottawa, are solicitors for applicants.

GRAND TRUNK PACIFIC.—The extension from McBride, B. C., west to Prince George, 144.7 miles, has been opened for business. The Calgary branch of the Prairie division has been extended from Beiseker, Alta., southwest to Calgary 38.4 miles.

The National Transcontinental has been extended from Edmundston, N. B., west to Escourt, Que., 55.8 miles.

HALLACK & HOWARD LUMBER COMPANY'S LINES.—Incorporation has been asked for in New Mexico by this company to build a line from Caliente, N. Mex., up Comanche valley to Ojo Caliente canyon. The line will be built to develop the timber land west of the Rio Grande in Rio Arriba county. The headquarters of the lumber company are at Denver, Colo., and the New Mexico office is at Santa Fe. Joseph H. Howard, C. Hallack and W. H. Bryant, all of Denver, may be addressed.

HOUSTON & BRAZOS VALLEY.—The Mound branch has been opened for business from Freeport, Tex., to Bryan Mound, 3.4 miles. (December 5, p. 1099.)

INTERPROVINCIAL RAILWAY.—See Rimouski International.

KANSAS & OKLAHOMA SOUTHERN.—Incorporated in Oklahoma with $1,000,000 capital and principal office at Perry, Okla. The new company is a reorganization of the Cherryvale, Oklahoma & Texas, which was incorporated several years ago to

build lines in the states of Kansas, Oklahoma and Texas. It is understood that work on the 61-mile section from Caney, Kan., southeast to Vinita, Okla., will be continued. S. M. Porter, Caney, Kan., is the chief promoter; R. E. Wade, G. A. Masters, Perry, Okla.; O. J. H. Brewster, F. D. Brewster, Independence, Kan., and H. V. Bolinger, Caney, are incorporators.

Minneapolis, St. Paul & Sault Ste. Marie.—The Flaxton line on the Minnesota division has been extended from Ambrose, N. Dak., west to Whitetail, Mont., 86 miles.

Murfreesboro Electric.—An officer writes that surveys on the section between Nashville, Tenn., and Murfreesboro have been completed. The company was organized some time ago to build from Nashville, Tenn., southwest via Murfreesboro to Woodbury, about 50 miles. R. T. Wilson, president, and G. B. Howard & Co., engineers, Franklin, Tenn. (February 13, p. 45.)

New Orleans, Mobile & Chicago.—An officer writes that the company will build an extension from Beaumont, Miss., south, to connect with the Louisville & Nashville, but at the present time cannot give particulars of the work to be carried out. (February 20, p. 407.)

Oregon Short Line.—The Oregon Eastern branch has been opened for business on the Idaho division from Vale, Ore., west to Juntura, 58 miles.

Piedmont & Northern Lines (Electric).—The line north of Greer, S. C., has been completed, and through service has been established from Greenwood and Anderson north to Spartanburg.

Rimouski International.—The Canadian parliament is being asked to change this company's name to the Interprovincial Railway; also to increase the capital stock from $3,000,000 to $4,000,000, and to extend the time for the construction of the authorized line from Rimouski, Que., and following the Rimouski river to Duquesne township, thence westerly toward Lac des Aigles, and following the Biencourt river to the first Squateck lake and via the second Squateck lake and the great Squateck lake also Owens river and the west branch of the Iroquois river to Edmundston, N. B. The company also asks for authority to build a line from St. Germain de Rimouski, Que., toward Edmundston, N. B. Asselin & Asselin, Rimouski, Que., are solicitors for applicants.

Southwestern Pacific.—According to press reports this company will ask for incorporation with a capital of $60,000,000, to build from Grand Junction, Colo., to a point on the Pacific coast, either in southern California or in Mexico, also to build branch lines. Financial arrangements have been made, it is said, and the final surveys are completed. It is expected that construction work will be started in the fall of this year, and the work pushed to completion. Rolla E. Clapp, consulting engineer of Salt Lake City, Utah, and Charles C. Carnahan, Chicago, are said to be interested. (See Colorado Roads, February 13, p. 345.)

Utah Light & Railway.—This company will build an extension this year from the present terminus at Centerville, Utah, it is said, north to Farmington, about 5 miles. Plans have been made to build a further extension north to Ogden, about 20 miles.

Zwolle & Eastern.—This road has been extended from Blue Lake, La., to Sanderson, 5 miles.

RAILWAY STRUCTURES

Baltimore, Md.—The Pennsylvania Railroad has given a contract to the Brown-King Construction Company, Philadelphia, Pa., for a reinforced concrete bridge to be built over the tracks of the Philadelphia, Baltimore & Washington at Mount street. It will be 80 ft. long and 66 ft. wide, and will cost about $50,000.

Lambton, Ont.—Bids are wanted by A. L. Hertzberg, division engineer of the Canadian Pacific at Toronto, Ont., up to noon of March 18, for the excavation, masonry and concrete work in connection with the double tracking of Humber river bridge, near Lambton.

Memphis, Tenn.—The Arkansas & Memphis Railway Bridge & Terminal Company has awarded a contract to the Pennsylvania Steel Company for the steel superstructure of the cantilever bridge across the Mississippi river at Memphis.

Railway Financial News

Central of New Jersey.—A list of the 50 largest holders of stock has been compiled and shows that of the total 274,368 shares, with a par value of $100 and a market value of about $300, the Reading Company owns 145,500 shares; Fahnestock & Company, 11,920 shares; George F. Baker, of the National City Bank, 8,000 shares; Winslow, Lanier & Company, 6,400 shares; Henry Graves, Jr., 5,225 shares; estate of J. A. Garland, 4,800 shares; Joseph Pulitzer, 4,000 shares; P. A. B. Widener, 3,200 shares.

Chesapeake & Ohio.—See editorial comments.

Chicago, Rock Island & Pacific.—The agreement under which holders of preferred and common stock of the Rock Island Company—the holding company—are asked to deposit their stock, contains provisions as follows:

The committee may adopt by a vote of two-thirds of its members a plan of reorganization, and by a like vote may modify any plan or adopt a new plan. Copy of any plan adopted must be mailed to each holder of a certificate of deposit, but it shall not be necessary to give notice of a modification of the plan unless such modification is a material modification thereof. Each holder of a certificate of deposit may be presumed to have assented to a plan unless within thirty days he shall have filed written notice of his dissent with the committee.

The committee shall be the sole judge as to when and whether sufficient assents to any plan have been obtained and as to whether other circumstances and conditions warrant declaring such plan effective. Holders of certificates of deposit not assenting or dissenting within thirty days shall be deemed to have assented. The agreement says: "A plan of reorganization adopted or approved by the committee may provide for exchange of deposited securities directly or indirectly for the securities of another company or companies now organized and existing, or which may be organized and may require the payment of cash subscriptions or assessments by the depositors as a condition precedent to participation therein."

The owner of a certificate of deposit may at any time prior to adoption of plan of reorganization and his assent thereto, expressed or implied from failure to dissent, withdraw his deposited securities after payment of his proportion of compensation, expenses and obligations of the committee to that date, not to exceed one-eighth of one per cent. of par value.

The committee may limit or extend the time within which, and fix the condition under which deposits may be made under this agreement, may impose penalties in respect to deposits after such limit shall have expired and may in its discretion, with or without penalty, accept deposits after the time has expired.

The Public Service Commission of Illinois has given its permission to the Chicago, Rock Island & Pacific to issue $7,500,000 2-year 6 per cent. notes, secured by first refunding bonds of the St. Paul & Kansas City Short Line and the Rock Island, Arkansas & Louisiana.

Erie.—The collateral security back of the new $13,500,000 Erie 5½ per cent. gold notes, dated April 1, 1914, is as follows: $14,839,000 Erie first consolidated mortgage general lien 4 per cent. bonds; $985,000 Erie general mortgage 4 per cent. convertible 50-year gold bonds, series "B"; $600,000 Elmira, Corning & Waverly first mortgage 5 per cent. bonds; $95,000 Mutual Terminal Company of Buffalo 4 per cent. notes, payable July 1, 1924; $6,306,000 par value New York, Susquehanna & Western preferred stocks; $163,100 par value Lehigh & Hudson River stock; $145,700 Temple Iron Company stock; $750,000 par value New Jersey & New York preferred stock, and $1,000,000 par value of New Jersey & New York common stock.

St. Louis, Iron Mountain & Southern.—W. H. Lee, president of the Merchants' Laclede Bank of St. Louis, has been elected a director, succeeding O. L. Garrison, resigned.